

LEARNING THE ROPES:

How Freshmen Conduct Course Research Once They Enter College



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Abstract: This paper presents findings about the challenges today’s college freshmen face, and the information-seeking strategies they develop, use, and adapt as they make the transition from high school to college and begin to complete college-level research assignments. Included are data from a comparative analysis of library resources in 30 US high school and 6 college and university libraries; interviews with 35 first-term freshmen from 6 US colleges and universities; and an online survey with 1,941 US high school and college student respondents. Findings indicate a majority of freshmen find it difficult to effectively search academic library portals. To a lesser extent, they struggle with reading and comprehending scholarly materials once they are able to find them and have trouble figuring out faculty expectations for course research assignments. Taken together, our findings suggest the Google-centric search skills that freshmen bring from high school only get them so far with finding and using trusted sources they need for fulfilling college research assignments. Moreover, many freshmen appeared to be unfamiliar with how academic libraries—and the vast array of digital resources they provide—can best meet their needs. Included are recommendations for how campus-wide stakeholders—librarians, faculty, and administrators—can work together when instructing freshmen to be better researchers.

Introduction

In fall 2012, a record number of students entered college.¹ They spent 13 years preparing for this milestone, taking college prep or advanced placement courses, assembling extracurricular activities, and scrambling for high marks and top test scores.

As soon as the acceptance letters arrived, most students' planning went into high gear. They likely spent hours online figuring out which courses to take, scouring comments posted on RateMyProfessor.com, lining up housing, and getting to know their roommates on Facebook—all months before setting foot on campus as freshmen.

But getting into college was only the beginning. Many freshmen, who assumed everything they needed to know was just a Google search away, soon discovered they were unprepared to deal with the enormous amount of information they were expected to find and process for college research assignments. This transition from completing high school assignments to doing college-level research is one of the most formidable challenges that incoming freshmen face.

Project Information Literacy (PIL) is a national series of research studies about how college students find and use information in the digital age.² This report is the second in PIL's series “The Passage Studies.”³ The purpose of these studies is to investigate the information transitions that students make at critical junctures in their lives.⁴

In this study, we investigated the challenges facing today's college freshmen and the information competencies and strategies they develop and use as they advance from high school to college.⁵ At the same time, we examined differences between high school and college information resources and how the students' research activities evolve. Finally, we asked what insights can be gleaned from studying this process in the hope that it will lead to improvements in preparing them for success in the digital age.

Major Findings

According to the first year students we interviewed, completing college-level research assignments was both “exciting” and “overwhelming.” Many relished their newfound freedom to explore topics of their own choosing. But most were intimidated by the plethora of print and online sources their college libraries offered and uncertain how to access or use them.

¹ U.S. Census Bureau (2012). *The Statistical Abstract Book: The National Data Book*. Washington, DC: US Census Bureau. Table 219. School Enrollment: 1980 to 2020. <http://www.census.gov/compendia/statab/2012/tables/12s0219.pdf>

² Project Information Literacy (PIL), <http://projectinfo.org>, is a public benefit nonprofit (501c3) that conducted this study in partnership with the Information School at the University of Washington, <http://ischool.uw.edu/>. Alison J. Head, Ph.D. is the Executive Director of PIL and a Research Scientist in the UW Information School. She is also a Faculty Associate at the Berkman Center for Internet and Society at Harvard, <http://cyber.law.harvard.edu>

³ In October 2013, PIL released the first Passage Study report: Head, A. J. (2012). *Learning Curve: How College Graduates Solve Information Problems Once They Join the Workplace*. Project Information Literacy Research Report. http://www.projectinfo.org/pdfs/PIL_fall2012_workplaceStudy_FullReport_Revised.pdf

⁴ We are deeply grateful to the PIL Research Team that contributed their time and efforts conducting interviews, coding logs, and providing support: Elizabeth L. Black (Ohio State University), Laureen Cantwell (University of Memphis), Kirsten Hostetler (University of Washington), Ann Roselle (Phoenix College), and Michele Van Hoeck (California Maritime Academy).

⁵ Communication about this report should be sent to Dr. Alison J. Head at alison@projectinfo.org

We found a majority of first-term freshmen faced challenges in both locating and then searching through research information systems and services on their new campus. Moreover, most found it difficult to figure out the critical inquiry process while developing competencies, practices, and workarounds for evaluating, integrating, and applying the sources they found.

Of course, not all new college students were "terrified" about getting through their first year; some simply stuck to Google and the other strategies they had used in high school. Others were interested in going beyond these strategies, but were worried about getting mired in the weeds of research. Librarians and faculty could steer these students in the right direction—but this got them only so far.

Our major findings are as follows:

- 1) Once freshmen began to conduct research in college for assignments, they soon discovered that their college library was far larger and more complex than their high school library had been. The average college library in our sample had 19 times as many online library databases and 9 times as many books and journals as the average high school library.
- 2) It was daunting to conduct online searches for academic literature. Nearly three-fourths of the sample (74%) said they struggled with selecting keywords and formulating efficient search queries. Over half (57%) felt stymied by the thicket of irrelevant results their online searches usually returned.
- 3) Learning to navigate their new and complex digital and print landscape plagued most of the freshmen in our sample (51%). And once they had their sources in hand, more than two-fifths of the freshmen (43%) said they had trouble making sense of, and tying together, all the information they had found.
- 4) Most freshmen said their research competencies from high school were inadequate for college work. As they wrapped up their first term, freshmen said they realized they needed to upgrade their research toolkit.
- 5) Many freshmen were in the process of trading out Google searches that satisfied high school assignments for searching online library databases that their college research papers now required. Yet other students said they still relied on their deeply ingrained habit of using Google searches and Wikipedia, a practice that had been acceptable for research papers in high school.
- 6) In the short time they had been on campus, a majority of first-term freshmen said they had already developed some adaptive strategies for shoring up their high school research skills. Most often, this meant they were becoming accustomed to reading academic journal articles. Some had discovered the usefulness of abstracts to save time and help them make selections.
- 7) Freshmen said they found campus librarians (29%) and their English composition instructors (29%) were the most helpful individuals on campus with guiding them through college-level research. They helped students chart a plan for tapping the wealth of research resources available through the library and formulating a thesis for their papers.

Learning to navigate their new and complex digital and print landscape plagued most of the freshmen in our sample.

- 8) By the end of their first year in college, many freshmen appeared to have begun using the same kind of information resources that college sophomores, juniors, and seniors were already using, according to the results of our national survey conducted as part of this study.

In the following pages, we present detailed findings from our analysis in three parts:

Part One: A comparative analysis of the information resources and services that 30 high school and 6 college and university libraries make available to students.

Part Two: Findings from 35 in-depth interviews with first-term freshmen about the differences between college-level and high school-level research and the difficulties they encountered during the research process.

Part Three: Results from an online survey about the research practices students used during the past academic year, based on responses from 1,941 high school and college students.

The findings from this study are intended to give insight into the ways freshmen find and use information.⁶ Given the limited size of our samples, however, these findings should not be viewed as comprehensive, but rather as exploratory and as part of our ongoing research. Our plan is to more rigorously test our findings from this small study in future research using quantitative methods and a larger sample. ❖

Approach

Our studies are grounded in research on information-seeking behavior. As information scientists, we study the ways in which college students conceptualize and operationalize information seeking. We seek to understand their use of specific strategies, workarounds, and practices. We investigate these processes through accounts, reports, and experiences from students enrolled in US community colleges and public and private colleges and universities.

The purpose of this study was to investigate how freshmen were making the transition from high school to college as information-seekers, users, and creators. Few studies have investigated how today's first year students make the transition to college and conduct college-level research.⁷

Five research questions framed our study:

- 1) How does the quantity of information resources and services available through college libraries differ from those in the libraries of the interviewees' high schools?
- 2) How do first-term freshmen begin to navigate the new and complex digital and print information spaces that college settings present and that college-level research requires?

⁶ A short video highlighting findings is available at <http://www.youtube.com/watch?v=BWNGZUa952A&feature=youtu.be>

⁷ For example, the Cooperative Institutional Research Program (CIRP) at UCLA produces the annual survey report, *The American Freshman*. <http://www.heri.ucla.edu/tfsPublications.php> and the National Student Survey of Student Engagement (NSSE) annual survey report, *Beginning College Survey of Student Engagement*. <http://bcsse.iub.edu/bcsse-update/index.cfm>

- 3) What difficulties do freshmen encounter during the information transition from high school to college, and how are these difficulties resolved, if at all?
- 4) What information-seeking strategies and workarounds do freshmen adapt and apply from high school, discover during college, and begin to use for meeting the needs of college-level research assignments?
- 5) What gaps exist between the information skills that freshmen bring from high school and the competencies they were expected to use for college-level research?

To explore possible answers to these research questions, we collected data during the 2012-2013 academic year using three methods: (1) a comparative inventory of research learning resources, (2) first-term freshmen interviews, and (3) an online survey.⁸

Defining College-Level Research

At the core of our inquiry were questions about how freshmen learn and begin to put their skills for college-level research into practice. But what is *college-level research*?

We define college-level research as a highly inductive process, especially when it comes to completing research papers, the signature assignments in the humanities and social sciences. These papers entail choosing a topic, defining an issue, and taking a position backed by evidence culled from secondary resources (i.e., books, journals, and resources found on the Internet).⁹

The college research process involves interpreting, evaluating, and synthesizing the information sources that have been found. Through this discovery process, students become more knowledgeable about a topic. They are expected to make inferences and formulate an original proposition, argument, or what some students refer to as their "thesis."

The expected depth of investigation combined with using primary sources makes college research time-consuming.

A critical part of college-level research setting it apart from high school research is the necessity of "re-researching" a topic. Like photographers, students need to focus on their subject and then adjust and readjust the focus, as needed, as the discovery process unfolds.

The expected depth of investigation combined with using primary sources makes college research time-consuming. It usually takes skill to integrate scholarly sources and infer a broader meaning from them. It takes curiosity and a desire to learn something new. It also takes keen organizational skills to keep track of and document everything that has been found.

In PIL's ongoing research, we have found the college-level research process entails learning and using information *competencies* and *strategies*. We define *competencies* as the skills and

⁸ See the Appendix A in this report for a full discussion of Methods used in this study, 35 – 44.

⁹ We are grateful to Margaret Maurer and Constance Harsh, both faculty at Colgate University, who gave PIL permission for re-use of their essay, "Doing College-level Research, with Advice on Avoiding the Plagiarism Question." It was first written in 1976/1977 and originally entitled, "Doing College-level Research, with Advice on Avoiding the Plagiarism Question" and was for internal use at Colgate. Since, the essay has been revised to include Internet research and posted on the Web, <http://www.colgate.edu/offices-and-services/deanofthecollege/academichonorcode/theacademichonorcode/doingcollegelevelresearch>

knowledge needed to solve an information problem. This means students both understand what action needs to be taken to execute the task and how to perform that action.

We define *strategies* as deliberate plans, often highly individualized, that use these competencies to achieve an objective, depending on the problem and other constraints, such as time, availability of resources, and cognitive abilities.

Questions about how students conduct research have always been interesting to librarians. These questions have become more complex as the information landscape has shifted in the past 25 years from one of scarcity to one of overabundance.

Questions about how students conduct research have always been interesting to librarians.

The availability of online information resources, available through subscription-based online library databases (e.g., InfoTrac, JSTOR, PubMed) and on the open Web (e.g., government sites, Wikipedia, Google Scholar), has significantly changed college-level research. Today's college students need to develop keen research competencies and strategies for tapping, evaluating, and sorting through the proliferation of information sources available to them. ❖

Findings

Part One: Comparing Information Landscapes

Educational policy makers have traditionally identified three components of college learning expectations.¹⁰ College students are expected to: (1) take voluntary ownership of their learning and personal growth, (2) adapt to the pace of processing and retaining information for meeting course obligations, and (3) develop and master high-order thinking skills for interpreting complex arguments and drawing conclusions.

One strand of research uses metrics to show how college work can have an impact on students' lives. According to one often-cited figure, college students read 8 to 10 books to the 1 or 2 that their counterparts in high school may read over the same time.¹¹ Another measure finds that college students spend twice as much time as high school students do in preparing for courses.¹²

While these metrics are useful for showing the difference in workload between high school and college, they are of limited use in helping understand the information transition students make from high school to college. As information scientists, we asked a different question: How does the quantity of resources libraries make available to students differ between high school and college?

¹⁰ See Conley, D. T. (2007). *Redefining College Readiness*. Eugene, OR: Center for Educational Policy Research, University of Oregon. Produced for the Bill & Melinda Gates Foundation, <http://www.aypf.org/documents/RedefiningCollegeReadiness.pdf>

¹¹ Conley, D. T. (2003). *Standards for Success: An Introduction to Work Samples and their Uses*. Eugene, OR: Center for Educational Policy Research, University of Oregon.

¹² *Engaged Learning: Fostering Success for all Students* (2006). National Survey of Student Engagement (NSSE), Bloomington, IN. http://nsse.iub.edu/NSSE_2006_Annual_Report/

Research Learning Resources

We developed four information metrics for our analysis. These metrics were based on the quantity of purchased resources and services high school and academic libraries typically make available to students, beyond the vast resources available through the public Web.¹³

These *research learning resources*, as we came to call them, were resources, services, and systems that facilitated the course-related research process. Such activities include defining a research strategy, finding sources to use, checking a fact or backgrounding a topic, or writing and preparing an assignment for submission.

We collected data about four research learning resources:

- 1) Number of professionally trained librarians working on site (i.e., Masters of Library and Information Science degree holders);¹⁴
- 2) Number of available public computer workstations (computers with printers);
- 3) Size of a library collection (i.e., books and periodicals owned by a library);
- 4) Number of online library databases (e.g., InfoTrac, JSTOR, PubMed).

We interviewed librarians at 30 high schools and 6 colleges and universities to collect our data. This sample was derived from our interviews with first-term college freshmen, based on where they were enrolled in college and where they had graduated from high school.¹⁵

Once we had our data, we segmented the sample into small vs. large institutions, using the median for full-time student enrollment.¹⁶ This allowed us to draw some preliminary conclusions about the sample of students in our study. Figure 1 shows the matriculation patterns of the student sample used in our comparative analysis by percent and count of interviewees.

Figure 1: How Students Progressed from High School to College

Figure 1: Matriculation Patterns (from High School to College)		Colleges and Universities	
		Small	Large
High Schools	Large	38% 12	10% 3
	Small	42% 13	10% 3

n = 31 first-term freshmen, 30 high schools and 6 college and universities

¹³ The analysis of research learning resources presented is exploratory. We hope to conduct future research with a larger sample of institutions and of research learning resources.

¹⁴ This sample was made up of full-time professional librarians.

¹⁵ Two students in the sample had attended the same high school, making our analysis sample 30 high schools, based on the 31 students we interviewed.

¹⁶ For our sample, the median for high schools was 1,175 students (n=31) and the median for colleges and universities was 6,654 full time undergraduates (n=6).

Most students in our sample—8 in 10 of the freshmen (80%)—were enrolled in a small college or university. At the same time, 1 in 5 (20%) of the freshmen we interviewed were in a large college or university.¹⁷

Ratio Comparisons

To explore the availability of research learning resources available through libraries in high schools and college and universities in our sample, we calculated four ratio comparisons for all of the institutions in our sample.¹⁸

Figures 2A through 2D show results of our comparisons for professional library staff, public computing workstations, library collections, and online library databases. These two-by-two models show an illustrative depiction of these differences.

Figure 2A: Professional Staff with MLSs

Figure 2A: Number of Professional Library Staff		Colleges and Universities	
		Small	Large
High Schools	Large	10.3 x more librarians in college vs. high school	27.7 x more librarians in college vs. high school
	Small	7.5 x more librarians in college vs. high school	20 x more librarians in college vs. high school

n = 15 small and 15 large high schools; 4 small and 2 large college and universities.

Figure 2B: Library Public Workstations

Figure 2B: Library Public Workstations (i.e., computers w/printers)		Colleges and Universities	
		Small	Large
High Schools	Large	3.6 x more workstations in college vs. high school	7.2 x more workstations in college vs. high school
	Small	5 x more workstations in college vs. high school	10 x more workstations in college vs. high school

n = 15 small and 15 large high schools; 4 small and 2 large college and universities.

¹⁷ In our sample, the proportion of freshmen enrolled in small colleges and universities was nearly a third higher than national enrollment figures. See the US Digest of Education Statistics, http://nces.ed.gov/programs/digest/d12/tables/dt12_275.asp. For Fall 2011, the table indicates that 59% of US undergraduates were enrolled in colleges and universities that had 5,000 or fewer students (n=2,072,153).

¹⁸ A ratio comparison compares similar things by taking the size of one number to the size of another number. To calculate our ratio comparisons, we divided the mean for each of the four research learning resources for high school libraries (n=30) by the mean for college and university libraries (n=6). For descriptive statistics and averages of each research learning resource in the high school and college and university sample, see page 38 in the Appendix A of this report.

Figure 2C: Library Collection

Figure 2C: Size of Library Collection (e.g., books and periodicals)		Colleges and Universities	
		Small	Large
High Schools	Large	8.6 x larger collection in college vs. high school	6.6 x larger collection in college vs. high school
	Small	11.4 x larger collection in college vs. high school	8.8 x larger collection in college vs. high school

n = 15 small and 15 large high schools; 4 small and 2 large college and universities.

Figure 2D: Online Library Databases

Figure 2D: Number of Library Databases (i.e., InfoTrac) ¹		Colleges and Universities	
		Small	Large
High Schools	Large	35.6 x more databases in college vs. high school	3.9 x more databases in college vs. high school
	Small	32.6 x more databases in college vs. high school	3.5 x more databases in college vs. high school

n = 15 small and 15 large high schools; 4 small and 2 large college and universities.

Notably, the smaller colleges and universities in our sample had larger collections (2C) and more online library databases (2D) available to students through their libraries than did larger institutions.¹⁹ These results suggest that enrollment size was not necessarily a predictor of how many learning research resources a library provided in our sample.

Moreover, our results suggest resource allocation may be more complex than enrollment, alone. Other factors may come into play, including the impact of digital resource consortiums, budget cuts, and Title I funding in certain high schools that qualify.²⁰

From the two-by-two models of each research learning resource, we conclude:

- 1) Overall, freshmen in the sample had 16 times as many professionally trained librarians (i.e., MLS holders), on average, working in their college library compared to the number of librarians working in their high school. The majority of students in our sample, those who were attending a small college or university, had 9 times as many librarians than high school, regardless of whether they went to a small or large high school.
- 2) As a whole, first-year students, on average, had 6 times more computer workstations available to them if they entered a large college or university library. Most freshmen in our sample, those who were attending a small college or university, had 4 times as many workstations, on average, than what they had available in their small high school.

¹⁹ This applies even in our follow-up analysis results with Harvard's Lamont Library removed from the sample.

²⁰ Seven high schools in our sample (23%) were recipients of Title I funding, a federal program for public schools with a high percentage of low income families. Title I funding is dedicated to funding schools, both classrooms and libraries, so achievement levels can be raised for students at risk. See Appendix A, Figure 1 for high schools with Title I funding in the sample, 36.

- 3) As a whole, freshmen in our sample had entered a college with a library collection that was 9 times larger, on average, than their high school library collection. For the largest subset of freshmen in our sample that attended small colleges and universities, the library collections could have been 10 times larger, on average, than the collection in their high school libraries.
- 4) Overall, there were almost 19 times as many online library databases, on average, available to freshmen in our sample than there had been in high school. Notably, most of the students in our sample were enrolled in small colleges and universities where there were 34 times as many online databases, on average, available to them through the campus library.
- 5) As a follow-up analysis we ran ratio comparisons for databases without Harvard's undergraduate library in the sample. Harvard, due to its vast collection of online library databases, was an outlier in our sample.²¹ The results of our follow-up analysis (without Harvard) indicated there were 21 times as many online library databases, on average, available through the library to freshmen enrolled in small college and universities.

Taken as a whole, these comparisons indicate first-term freshmen in our interview sample had far more research learning resources available in their academic libraries than what they had in high school. These results may seem unsurprising given the different missions of high school versus academic libraries.

High school libraries (and their frequent partnerships with media centers) support a defined school district curriculum. To that end, they assist teachers and students with informational, curricular, and recreational needs.

College and university libraries support the instructional needs of students, faculty, and staff needs, too. But they typically have far more materials available for advancing scholarship and knowledge-production, both remotely and on site.

At the same time, though, these results are revealing. We found a staggering disparity of research learning resources between high school and college and university libraries in our sample.

We found a staggering disparity of research learning resources between high school and college and university libraries in our sample.

As such, the average college library in our sample had 19 times as many online library databases and 9 times as many books and journals as the average high school library.

These sizable differences in resources raise an important question: How did first-term freshmen in our sample deal with the sizable increase in research learning resources once they entered college and began to work on course research assignments?

In the next section, we turn our attention to first-term freshmen and draw on interview data. ❖

²¹ There were 1,005 online library databases available to undergraduates at Harvard, according to Harvard librarians we interviewed. The library facility, itself, was comparable to some of the other academic libraries in our sample, in terms of its on-site collection, number of workstations, and number of professional staff at Lamont.

Part Two: First-Term Freshmen Experiences

The large majority of today’s college freshmen have come of age in a time when Amazon, GPS, Facebook, and flat screen televisions are ubiquitous—but jobs are not. Though most of them are barely old enough to vote, the contours of the digital age have already begun to influence these students’ choices.

Most will take at least one online course, and for those that do, many will enroll in a massive open online course (MOOC) along with hundreds of other students from across the world. In many cases, they may never meet their peers face-to-face on their own campus.²²

In this section, we present qualitative findings based on 35 interviews conducted with new freshmen at 6 US colleges and universities.²³ We interviewed these students just as they were finishing up their first term (i.e., quarter or semester).

We explored the processes and strategies they used for navigating complex research learning resources and systems to complete research assignments. Importantly, we learned about the difficulties they faced, and how they adapted.

Overwhelmed, but Excited

First-term freshmen in our sample had written at least two college research papers at the time of our interviews. Many had written on independently selected topics such as the rising costs of veterans’ benefits, the efficacy of medical marijuana laws, the failure of welfare institutions, gun control debates, the imperative of legalizing euthanasia, and unintended consequences of nanotechnology.

Notably, all of the freshmen in our sample had completed some kind of formal library training during their first few months on campus. Some had become familiar with the library during orientation.

Others took part in a “one shot,” i.e., a session about conducting library research that is taught by an instruction librarian during a visit to one of their classes. Still, other students were enrolled in a for-credit course in information fluency, a required course taught by an instruction librarian.

Even though these background details signal a smooth information transition from high school to college, we found that there was more to the story. We first noticed inconsistencies when we asked first-year students for two adjectives to describe their feelings about finding and using information in college for fulfilling research assignments. The majority of freshmen used dichotomous pairs of words to describe their feelings: *overwhelming and exciting*, *overwhelming and amazing*, *scary and exciting*, and *stressful and competitive*.

The majority of freshmen used dichotomous pairs of words to describe their feelings: *overwhelming and exciting*...

For the most part, we found first-term freshmen were relieved to be free of rigid high school curricula.²⁴ They were eager to dive into deeper research projects on topics that interested them.

²² Nagel, D. (2008). Most College Students To Take Classes Online by 2014. *Campus Technology*. <http://campustechnology.com/articles/2009/10/28/most-college-students-to-take-classes-online-by-2014.aspx>

²³ See Appendix B of this report for the interview script we used, 45 - 47.

²⁴ Eight in 10 of the interview sample had graduated from high school in 2012, the same year that we conducted interviews with freshmen in the fall. See the Appendix A for additional demographics about the interview sample, 39.

And yet, at the same time, they were overwhelmed at the thought of sorting through the voluminous amount of information available to them in college. In their words, the finding part of research was described as “nerve wracking,” “foreign,” “intimidating,” and “terrifying.”

First-term freshmen often pointed to extenuating circumstances when first discussing college research with our interviewers. These students said research tasks could be “too much work” and they had “too much studying,” “too busy of a schedule,” and “not enough time.”

Most revealing, later into our interviews, we found freshmen say conducting research was overwhelming because they were unfamiliar with what college research entailed. Clearly, the high school experiences and the college library instruction they had, so far, did not prepare most of them for the rigors of college research.

How College Research is Different

First-term freshmen frequently mentioned four things that made finding and using information for college work different from high school (Figure 3). More than anything else, they said the campus library’s substantial collection of books and journals had made college research different. In their words, the college library had a collection that was “ginormous” and there was “a ton of stuff,” including both online and on-site resources.

The sheer multitude of available digital resources through the academic library—subscription databases and eBooks—surprised freshmen. For instance, many said they had never heard of library databases like JSTOR, PyscINFO, PubMed, and ABI/INFORM before arriving at college.

Many knew of just one or two library databases, such as Cengage’s Opposing Viewpoints or Britannica, which they may or may not have used more than once in high school.

Figure 3: What Makes Conducting Research in College Different than High School?

Four Factors that Make College Research Different	
1.	The academic library collection increases in size and digital resources proliferate.
2.	The research approach involves combining and using new and different sources.
3.	Research calls for selecting quality research sources, evaluated for their credibility.
4.	Assignments require independent choices and encourage intellectual exploration

Ordered from interviewees’ most discussed to least discussed differences; n = 35 first-term freshmen, 6 campuses

As a whole, many freshmen felt at a disadvantage from the start because of the limited research skills they brought with them. Most admitted they had only written one paper that qualified as a “real research paper” in high school. Usually this paper had been written for a high school English class. Now, they were being asked by professors in a variety of disciplines from politics to chemistry to anthropology to write research papers.

Freshmen said professors expected them to dig deeply into topics, more than they had ever done before. Yet, these students found they had little research experience from high school to leverage and apply to college research tasks.

As one freshman we interviewed explained:

In high school, because they don't have the resources, there is no way to prepare you for college. So if you don't have the resources, in high school it's like, 'We're sorry, we can't teach you how to use them yet.' Then you come here and instructors don't assume that you're fresh out of high school. They assume you're here to get an education and you're in college, so they say, 'Okay, go research this.' Yes, there's more resources and information, but we just don't know how to use them yet.

We found many freshmen were unfamiliar with the formats of scholarly publications before entering college. For example, many had never read the abstract in a peer-reviewed journal article. This was still the case even if their high school library may have had subscriptions through vendors such as EBSCO or ProQuest. Instead, many of these freshmen said they had relied on the public Web, not library databases, for high school research.

To a lesser extent, others said the approach to selecting research sources was entirely different from what they had learned in high school. Some said they could use only books for high school assignments, while others said they could use only online sources.

In college, freshmen found there were fewer constraints on the resources they could consult. They were now expected to integrate information culled from sources in a range of formats, such as scientific findings, books, databases, Web sites, and interviews.

In other cases, students said the college-level research placed a premium on "higher standards for research" and "finding good information," "using professional opinions," and "using valid statistics." These students said they were inexperienced with critically evaluating sources so to judge their quality:

In my seminar, we're talking about scholars who study Neanderthals and my professor keeps saying it's important to look at their methods and the conclusions they draw, but I have such a hard time not believing what they are saying is 100% accurate, I mean why would it have been published, I mean why do they have a Ph.D.? In high school, in my Shakespeare class, we discussed whether Shakespeare wrote everything, even though some people have said he did not, but my teacher said, 'Listen, Shakespeare wrote everything and other people just don't know what they are talking about.'

For many freshmen, though, the biggest difference in college research assignments was that they invited intellectual exploration in ways their high school research assignments had not. Freshmen were often free to choose a research topic that interested them and select materials for building their own argument:

High school is much more structured, teachers give you an idea they want you to find, they point you in that direction, they give you links, and there's time as part of class to go do your paper in the library. In college, there are so few constraints in terms of topics—pick something that interests YOU and that has something to do with what we have been talking about in class, and that forces you to figure out what you are really interested in. For me, thinking about what I'm interested in is really scary, especially being forced to find something that I'm passionate about is kind of daunting.

Freshmen said professors expected them to dig deeply into topics, more than they had ever done before.

We found first-term students in our sample experienced some of the same challenges adjusting to learning how to use their new campus libraries. For instance, some freshmen said they were puzzled by the organization of library materials. For example, their high school and public libraries had used one system (i.e., Dewey Decimal System), their college library used an entirely different one (i.e., Library of Congress):

From what I can tell, it's organized different than my high school library was. I think things are organized by topic here, instead of by the numbers on the book's side and it's different, I mean, really, how long have you been learning how to use libraries and how they are organized? And then they just kind of throw you in here—it's really my biggest change with information on this campus, it's frustrating to say the least.

In other cases, students discovered an inconsistency with interface design, especially search options available on different vendor's online library databases. As one student said, the high school version of ProQuest's database that she knew was like "a training wheels version" of what she found in college from the same vendor.

To a lesser extent, others said they were used to consulting a high school librarian. This librarian had been a jack-of-all-trades that could help with loading printer paper to finding a book on the shelves. In comparison, the college library had more staff and more support. These freshmen had little idea about who to ask for help:

When you look up something on PubMed it will have a link to a link to maybe another link and when you get to the third link you finally get actual access to the article you want, but sometimes they are dead links. In fact, I have a whole list of articles I can't access and I'm going to have to go talk to someone in the library, and I haven't talked to a librarian on this campus before, but do I ask them? Or do I go to the circulation desk and say "I need help with finding articles." I'm not sure whom to ask that's why I haven't done anything yet, but the paper is due soon, I just don't know.

Passage to Higher Education

Our interviews suggest the information transition from high school to college is challenging for first-term freshmen. Nearly all of the freshmen we interviewed were in the process of evaluating their high school research kit and retooling it—if for no other reason than to deal with the vast amount of information available through their campus library. For the majority of first-term students in our sample, this passage involved going beyond "Googling it."

We found freshmen in the sample were at different stages of this complex process. Some said that adjusting to college research had been easy for them. These students said they relied on Google searches and the few databases they knew from high school for completing college assignments. In their words, this relative minority of students were "sticking to their guns" and "using the same process since high school," since they knew it had "always worked well."

In far more cases, first-term freshmen were guardedly engaged...

In far more cases, first-term freshmen were guardedly engaged. They had begun to explore their new information landscape—as best as they knew how. Their exploration often began with an online search in the library portal of the plethora of new research resources available to them. These students said they used academic literature for different reasons. Some said they relied on journal articles because this was what their professors expected. Others knew it was where they could find scholarly research and scholarly opinions. Still, others relied specifically on journal articles for the "speed of it" compared to having to read a entire book.

Difficulties with College Research

As they fulfilled their first college-level research assignments, difficulties inevitably cropped up for first-term freshmen. In order to understand the precise difficulties first-term freshmen had with college research, we conducted a content analysis of the interview logs.²⁵

We used 14 individual coding properties. We identified these properties, based on the frequency in which freshmen described—in their own words—their difficulties with the college-level research process. If an interviewee mentioned having the same kind of research difficulty more than once in an interview, we only counted one instance in our results. Figure 4 shows our coding results.²⁶

Figure 4: Which Individual Research Tasks Were Most Difficult for First-Term Freshmen?

Most Difficult Research Tasks	Count	Frequency
1. Coming up with keywords to narrow down searches on the academic library portal	26	74%
2. Filtering and sorting through irrelevant results from online searches	20	57%
3. Identifying/selecting potential sources and investigative methods from all available	18	51%
4. Integrating and summarizing writing styles from different sources/formats	15	43%
5. Delineating assignment parameters and defining and selecting a topic	13	37%
6. Reading and comprehending materials from different formats	12	34%
7. Locating print information from search results (i.e., articles, books, chapters)	8	23%
8. Asking for help with research from faculty, librarians, or fellow students	6	17%
9. Evaluating sources for credibility and bias while reconciling different viewpoints	5	14%
10. Citing sources and using citation formats, based on faculty preferences	3	9%
11. Self-assessment of research process used and the sources found	3	9%
12. Technological issues, includes connectivity and authenticating logins	3	9%
13. Managing and organizing results from print and online sources	2	6%
14. Developing new understandings in order to formulate an original thesis/proposition	2	6%

Ordered from most frequent to least frequent difficulties with college research, according to 35 first-term freshmen, 6 campuses.

²⁵ Latent coding requires coders to make a qualitative and critical interpretation of inferred meanings in a text. The intercoder reliability for our results was .77. See Appendix A of this report for details about coding procedures, 40 – 41.

²⁶ Coders were instructed to code *instances* of when members of the freshmen interview sample discussed intractable difficulties, challenges, impediments, and frustrations with college-level research tasks.

As a corollary to these results and a basis for discussing their implications, we identified four significant categories of difficulties. Each of the following difficulties is discussed in detail on the following pages:

- 1) Formulating effective and efficient online searches;
- 2) Identifying, selecting, and locating sources;
- 3) Reading, comprehending, and summarizing materials;
- 4) Figuring out faculty's expectations for research assignments.

Detailed Description: Difficulties with the College Research Process

1) Formulating effective and efficient online searches. A large majority said they were challenged by figuring out keywords for unlocking the wealth of academic sources available to them through their campus library's portal. Some said they used Google in a two-step workaround. In the first step, these students did a Google search to see what keywords popped up, and then they placed some of these terms in a library database's search engine. Others grappled with finding a preconceived idea of a "perfect source" they needed. These students often had trouble translating their perfect sources into keywords that met the precise syntax library databases require:

We had to do a paper about something that affects children in a negative way and I chose how moving affects children and their development and how they socialize with other people. It took me an hour to know what words to use. I was sitting there using my laptop and it was really hard because I was typing 'families that move a lot' and I saw nomads come up, and I thought, maybe nomads would be something, like 'nomadic families,' but that had nothing to do with it. It's that anxiety when you type in words and none of the words match the results and you're like, okay, let me try this, and you have a limited amount of time—that's a problem.

Grinding through endless screens and trying to cull relevant material was another frustrating part of search, according to many of the freshmen we interviewed. These students said if they could "crank down"—narrow—their search queries beforehand, they were more likely to reap useful results. But for many, searching on library database interfaces was entirely new, and it was difficult to figure out how different search engines worked. After spending years defaulting to Google searches for finding information, others said they were lost when it came to incorporating Boolean operators and faceted searching into their strategies:

You have to really put in the right words into the academic search engine. Sometimes I'd put in a word like I'd do in a Google search and it pulls up things that I'm not looking for. The librarian came to our class and told us how to do this certain search logic, and so when you use that it is a lot easier to find the sources you're looking for. But, I've noticed that if you try to use an academic search engine like you'd use a Google search, it won't work as effectively, so it takes knowing how to different search engines work.

2) Identifying, selecting, and locating sources. A majority of freshmen in our sample said they were overwhelmed by the variety, quantity, and newness of potential sources available through their campus library:

So, I'd go onto the Internet, click on library, click on e-sources, and, there would be all these different types of subcategories, and I was like, 'What do I use?' Do I use EBSCO or do I use Britannica or all these other things? That is what made it difficult, because I really didn't know which link to click on.

Unlike high school work, college-level research seemed to have an infinite number of ways to find sources, according to the interviewees. First-term freshmen often described having floors of books, portals full of library databases, and scientific findings and sources from the public Web they could access for college-level research assignments. Some students were confused by the practice of combining familiar sources (e.g., books, Google) with unfamiliar sources (e.g., PubMed, JSTOR).

In other cases, some students had a hard time keeping track of notes, articles, and quotes from the different kinds of online and print sources they had found. In their words, hunting down print sources from a list of citations could be "tedious," "full of surprises," "unpredictable," and "confusing." Even though some said finding sources was easy for them, many often learned otherwise once they tried to locate specific sources:

One of the criteria was to gather an outside source on your own and then a source that Deborah Tannen cites in her book. So, at first, it was kind of a challenge to go through the whole list of sources and try to find one of the sources here. Some of them were books and some of them were articles. I would find a book but then realize the library has access through some other library on the other side of the state and they could have gotten it but it would have taken weeks, and it wouldn't really help. Then, I found some articles with reviews, but it wasn't the full article, just some review. Some were here, but not here and were at different libraries on campus.

3) Reading, comprehending, and summarizing materials. Once they had some trusted sources in hand, about a third of the freshmen said they floundered with reading different formats and making sense of what they had found. Many had never seen, let alone read a journal article or an abstract before. At the same time, students wrestled with understanding what authors meant, given their lack of familiarity with scholarly language and writing style. A few students mentioned that they used an online dictionary as they read to help them understand the terminology in journal articles:

...about a third of the freshmen said they floundered with reading different formats and making sense of what they had found.

It's the reading, deciphering what you've found that's most difficult. So, I used an online dictionary to figure out words meant for my paper on nanotechnology. I mean I read three sentences and I would need to go look up seven words out of those three sentences! It worked for me, I learned a lot from reading like this. It's the only way to understand what they are saying, I mean if you are not reading with a dictionary then you won't be able to get it. It's just what it takes.

Some freshmen we interviewed said they had trouble with selecting meaningful passages and tying it all together. In their words, they had problems "connecting the dots," "figuring out the hook," and "discerning what you're going to use." They purposely selected sources from the results page that had a common thesis or similar interpretation of the same set of facts, as a way of gauging the credibility. As one student explained, "I know if it's printed several places, then it's true and I can use it." In other cases, students had trouble selecting which quotes to include in their papers:

How do you read a 30-page article and pick out a few meaningful quotes? I mean what is the right, exact quote to select and use? I am just kind of picking from here and picking from here and there for this paper. I just don't know. I mean is the writing I do in my composition course representative of the rest of the writing I do in college?

4) Figuring out faculty's expectations for research assignments. Even though freshmen said they had initially welcomed research assignments that let them define a topic independently, about a third of them said they were unsure whether the information they presented would meet instructor's expectations for college research. One student explained, "In high school you know the grading scale and you know what's expected of you, but when you come to a new place you kind of worry when you're writing papers, I mean, is this enough information for college? Do I need more?" Many first-year students said it was difficult to get "straight answers" from faculty:

Sometimes the hardest part of figuring out how to do the research for a project is knowing what specifically the professor is going to be looking for; it can be really broad sometimes the way the topic is presented. So, I ask a whole lot of questions to try and figure out like, 'Well, what are you looking for? Should I use my own voice? Is it personal? Is it not 'I' statements or is it all just broad, general information you want in the paper?' So that part, just narrowing down what professors want in the first place is a challenge sometimes; some of them are really specific, and some of them aren't.

Furthermore, students found it difficult to know how to format papers. According to some freshmen we interviewed, different professors had different preferences. These students were unsure about when to cite sources, how to format citations and in which, if any, particular citation style. Asking faculty for help or going to office hours "intimidated" and "embarrassed" some students. Still others said they welcomed—even depended—on faculty guidance and coaching:

I just came from a conference with the instructor. My thesis needs to be more involved, more specific, than what I have. I am writing about the Zodiac murders and the media. My thesis now is too general. It's all about the media because I got caught up in that, so now the sources and quotes I've got may not be as applicable if I end up changing my thesis. So, I have to go back and think maybe this doesn't fit and then I need to dig deeper on my research and find the opinions that go with what I'm trying to say. So, it's researching and then re-researching that makes it hard. And then I find something new and think 'Oh, yeah, that may be better for me to use.' It's more involved than anything I've ever done. I didn't do a ton of research papers in high school. I mean, oh God, I can't believe I am writing my third draft of this paper and I'm still not done!

Taken together, our interviews suggest many first-term students were challenged in trying to map their limited research experiences from high school to far more demanding expectations for college-level research. More than anything else, they faced difficulties with learning to navigate their new college information landscape and going beyond simply constructed Google searches.

We conclude freshmen tended to fall into three broad categories, based on the amount of research they had done in high school. Some had no idea what a college research paper entailed and had never set foot in their high school library, if there even was one.

In other cases, some students had written one or two research papers in high school that were more like essays or book reports. These students usually relied on the public Web and sites like Wikipedia for research. A third group of students said they had written one or two papers in an English (often AP) class during high school. These papers required research on a much smaller scale than what they were now being asked to conduct in college.

...many first-term students were challenged in trying to map their limited research experiences from high school to far more demanding expectations for college-level research.

Our findings suggest many freshmen were overwhelmed with the first part of the research process—finding—and were often relieved when they had some sources in hand. But other problems inevitably arose for most of them. They soon found themselves struggling with reading, comprehending, evaluating, and applying the scholarly sources they had found. These were the higher order thinking skills necessary for college-level research.

Freshmen Myths

Throughout our interviews, we found prior experiences and beliefs colored freshmen’s perceptions about the college-level research process. As an exploratory analysis, we identified five recurring misconceptions our interviewees’ expressed about libraries, college-level research, and college assignments. These misconceptions might be called “freshmen myths.”

Even though some of these myths may resonate with some readers they should not be considered applicable to *all first-term freshmen*. As such, the myths we have identified are not intended to represent the nationwide freshmen population. We would need a different larger, randomly-selected sample to make that generalization.

Still, we found these observations provocative and worthy of comment, even when generalizing only to our particular sample. What we are reporting in Figure 5 is that there was a commonality in some of the myths freshmen in our sample discussed. This analysis provides a useful perspective for thinking about the preconceived notions some first-term freshmen may bring with them about research.²⁷

Figure 5: Some Freshmen Myths about College Research

Five Myths about College-Level Research Assignments	
1.	College is about being independent; most students don’t need to ask for help.
2.	Everything is online, so going to the campus library isn’t that necessary anymore.
3.	Reference librarians are available only to students who have gotten stuck on their research.
4.	A scholarly database(s) recommended by a librarian is the only source worth checking.
5.	Books on library shelves are outdated leftovers, rarely offering anything relevant to research.

Ordered from most frequent to least frequent “freshmen myths,” according to 35 first-term freshmen, 6 campuses

More than anything else, many freshmen we interviewed seemed to think college work required a high degree of self-sufficiency. These students said asking for help from someone in authority—professors, librarians, tutors, or writing center faculty—was unacceptable and simply not done.

²⁷ Findings from our small qualitative sample would benefit from being tested using quantitative research methods and a larger sample. Our hope is to investigate these myths and the frequency of their occurrence in a future research study.

In their words, their college research assignments made them feel that they were supposed to be "out there on your own," "kind of stuck on your own," and "people won't tell you the answers, they expect you to know." As one first-term student put it, "professors tell you this is your assignment and you're on your own to go find your way through the library, find your way through the Internet, and through the databases."

In other cases, there were freshmen that said college research involved using online sources and that was it. As one first-term student said, "Everything I needed was online, why go to the library?" We found these students were often unfamiliar with the array of services and resources through campus libraries. Some first-term students seemed to believe the library shelves were lined with outdated materials that were rarely useful or worth checking out.

Other first-term students in our sample seemed to think reference librarians were a specialized service—available to only certain students, not them. These students thought librarians were available by appointment for students who had hit a roadblock in their research process. As one freshman said, librarians are only for "dedicated students who know they need to seek out help."

Other first-term students in our sample seemed to think reference librarians were a specialized service—available to only certain students, not them.

To a lesser extent, some freshmen seemed to have an inflated idea of the recommendations librarians made about which sources to use; thinking they needed to look no further. As one student said, "There's a lot of databases, but the librarians showed us in the beginning there's the first five and these are the ones that are good for this, so I use them."

As one freshman explained:

That handout from the librarian for the paper about film, I went back to it and used it for my Chem paper. Even though the film databases didn't apply, I just went with the general ones the librarian recommended, like Academic Search. Writing the Chem paper there are just so, so many academic journals and finding papers that are at my level, I mean that I can understand, I didn't know where to start, so I went back to that librarian's handout.

Taken together, our exploratory analysis of freshmen myths provides insights into some of the beliefs today's incoming freshmen may bring with them about college, academic libraries, and the task of course research. Some new students' misconceptions seemed to persist. Other freshmen had already begun to question and even debunk these myths. These students had begun to learn and adopt the culture and practices of college.

Guidance and Help

We found instructors and librarians played an integral role in acclimating freshmen to the world of college research (Figure 6). In fact, composition instructors in entry-level English courses (29%) and librarians (29%) were identified by freshmen as being most helpful with learning the college research process.

This finding bodes well for librarians and their information literacy outreach efforts. It suggests that "one shot" sessions, instruction, and reference services may resonate, on some level, with these first-term freshmen. In their words, a majority of the sample of the freshmen described librarians as "helpful," "knowledgeable," and "available."

Figure 6: Help and Guidance with Learning College Research Process

Who's Most Helpful?	Count	Frequency
1. English composition instructors	10	29%
2. Reference and instruction librarians	10	29%
3. Other professors (e.g., freshmen seminar)	7	20%
4. Upperclassmen	3	9%
5. No one (i.e., figure things out on their own)	2	6%
6. Tutors	1	3%
7. Writing lab	1	3%
8. Counselor/advisor	1	3%

n = 35 first-term freshmen, 6 campuses

As one freshman said about librarians:

I just found out when the librarian visited our class that talking to her in the library was an option—I had no idea. I went to the reference desk and I said, ‘I’m looking up Finnish education but I’m really having a hard time finding something, an article that says America’s educational system is great, I can’t find anything.’ She said, try this, try this, and try that. She gave me different ways of thinking about going and using the databases. She taught me new tools so you can narrow your search down so you are not looking stuff from, like, 1950. I went and saw a librarian at the end of my research process, but honestly, what would really be good though, is go to them in the beginning.

Despite these favorable experiences with reference librarians, some freshmen said they needed more. One session was not enough for them to be able to learn and retain details about using the library’s online databases:

Those databases—if the librarian that showed it to us in class is not around, I could very easily get lost. I did get lost! I was in my dorm trying to do it one time on that Lexis-Nexis thing and I was kind of stuck, I didn’t know and I had forgotten what she said in the lecture, so I had to come down to the library and ask somebody do you know how to use this and that and it was a struggle, but they helped.

When we asked, few of these students said they had followed up with a librarian when they ran into problems with research. Likewise, our coding of freshmen difficulties (see Figure 4) indicated that 17% of the interviewees said that they had trouble with asking for help from faculty, librarians, or fellow students.

Adaptive Strategies

Even though college research was challenging, a majority of first-term freshmen said they had started to develop adaptive strategies for carrying out college-level research (Figure 7). In some cases, freshmen described new workarounds using online tools so they could upgrade their high school practices.

For instance, one student kept track of references using Google Docs instead of index cards as they had done in high school. Several said they used “citation linkers” such as EasyBib and NoodleBib. They used these sites to build their bibliographies as they researched rather than compiling citations as a last step in preparing assignments for submission.

Figure 7: Adaptive Strategies for College-Level Research

New Information Competencies for College	
1.	Discovering peer-reviewed article abstracts and their usefulness.
2.	Using Google for finding keywords and checking authors' credibility.
3.	Replacing Google searches with Google Scholar searches.
4.	Following the “citation trail” to find related research sources.
5.	Using the college library as a refuge and source of professional help.

Ordered from interviewees' most discussed to least discussed adaptive strategies; n = 35 first-term freshmen, 6 campuses

More than anything else, freshmen discussed learning adaptive strategies for *facilitating the use of peer-reviewed scholarly publications*. For instance, freshmen said they had discovered the usefulness of peer-reviewed journal abstracts. In their words, abstracts “saved time” because they “knew the argument” before they started and the entire article was “easy to figure out.”

As one freshmen said:

Journal articles are completely new to me, I never read one in high school. Three out of four of my classes here have used journal articles in some shape or form, so I've been thrown into a sea of journal articles. The abstract definitely helps, it's so lovely, and it gives you a summary and it says, here is what we tested, here are our methods, so look for this when you are reading the paper because if you can't catch this you are clearly on the wrong track!

In other cases, freshmen said they used Google or another search engine in order to conduct *presearch* before diving more deeply into their research process.²⁸ Some freshmen said instructors had recommended "Googling authors" and "using an Internet search for authors" so they could "get some background context" and determine the credibility of a source:

I look up authors right after I have a source, much earlier on, to help me evaluate the source that really helped me a lot. On the Internet, I can see their other books. I try to read a little bit, the author's notes, commentary, to see where they're coming from. It's so valuable, I can't even stress how valuable. You need to know that, what their motivation was for writing the article, what their agenda is.

To a slightly lesser extent, many said they had learned to use Google Scholar from librarians and writing tutors for the first time. Some were surprised to find the site was just a tab away on the ever-popular Google search page.

Using Google Scholar, instead of Google search, gave them an alternative to needing to use (and learn) online library databases on the library's portal. Others admitted Google Scholar was a stopgap workaround they could use for finding academic sources.

Some students said they had learned to mine course textbooks and journal articles for research references. Many had rarely used textbooks, other than in math classes during high school, so they were unfamiliar with their formats.

The campus library was, as one freshman said, "a quiet learning place."

Finally, some freshmen said using the campus library was new to them. The campus library was, as one freshman said, "a quiet learning place." Moreover, freshmen said they could get help from reference librarians if they were in the library. Freshmen said they had heard about library services from multiple sources, including faculty, librarians, tutors in a writing workshop, or a classmate:

In the beginning I was doing my homework in the dorm but I was distracted by roommates. After a month, thanks to a friend, I decided to move to the library. Now I come every day. It helps me. I'm closer to everything I need. If I get stuck with a paper I can go upstairs to the Writers' Studio. If I need an article, the librarians are right here. Everything's closer. It motivates me.

Taken as a whole, freshmen were at different stages of acculturating to the college research process. Most knew they would need to adapt and grow their high school research skills in order to make it through the next four years. This called for developing strategies for plumbing the depths of academic literature that their campus libraries made so readily available.

Those who were the farthest along had begun using advanced search features on the library's portal to specify certain databases. In some cases, these students said they were surprised to learn library databases trumped their typical high school strategy of "Googling it."

An "aha moment" came when they realized they could narrow down search queries on library databases. They found they could specify date parameters and certain journals more easily than when using Google.

²⁸ In PIL's 2009 study, *Finding Context: What Today's College Students Say about Finding and Using Information in the Digital Age*, a student in one of our focus groups talked about using Wikipedia for "presearch" to get background about a topic before conducting "serious research" and moving on to using library databases, 12.
http://projectinfoil.org/pdfs/PIL_ProgressReport_2_2009.pdf

Most first-term freshmen in our sample, however, had not ventured that far with their online search strategies. The majority of these students preferred instead to use a one-search box on the library's portal. It gave them access to articles, books, and much more in one fell swoop.

To a lesser extent, there were those who were "Google persistent." These students had little inclination to start using the library's resources or services instead of the ubiquitous search engine. ❖

Part Three: An End-of-Year Comparison

So far, we have presented qualitative findings about the information transition first-term freshmen experience as they move from high school to college and begin to complete course-related research assignments.

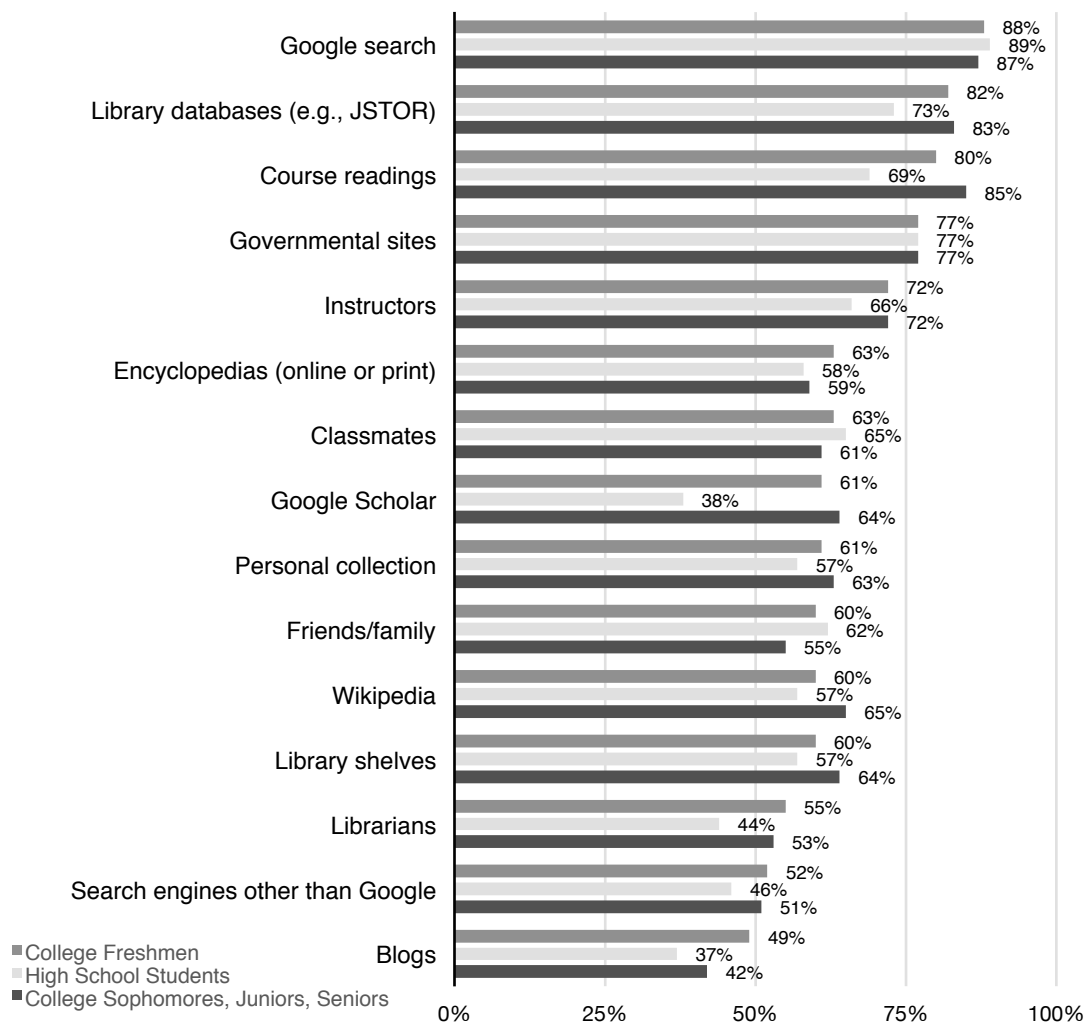
In this last section of findings, we provide a follow-up analysis taking a long view of the first-year freshmen. What happens to freshmen's information-seeking behavior by the end of the year? How do end-of-year freshmen differ from college sophomores, juniors, and seniors and from students who are still in high school?

We explored these questions by administering a voluntary online survey to a sample of US students during the final weeks of the spring 2013 term.²⁹

We asked high school and college students what information resources they had used during their course research process over the past academic year.

Figure 8 presents the results in a bar chart with a sample segmentation of (1) college freshmen, (2) high school students, and (3) college sophomores, juniors, and seniors.

²⁹ As far as we know, none of the first-term freshmen in our sample (n=35) of face-to-face interviews participated in the online survey (n=358) we conducted with a voluntary sample of US students at the end of the academic year. We are therefore treating the first-term freshmen interviews as one sample and the end-of-year student survey as another.

Figure 8: Information Resources End-of-Year High School and College Students Used

*n=1,941 (358 freshmen, 600 high school students, and 983 college sophomores, juniors, and seniors.
Responses of "almost always," "often," and "sometimes" have been conflated into a new category of "use."*

We summarize the key findings as follows:

- 1) Google was students' go-to preferred research resource, whether they were college freshmen (88%), high school students (89%), or college sophomores, juniors, and seniors (87%).
- 2) Eight in 10 freshmen (82%) and college sophomores, juniors, and seniors (83%) in the survey sample reported using library databases for course-related research—almost as much as they did Google. To a lesser extent, high school students (73%) had used library databases in the past academic year.
- 3) Almost two-thirds of the freshmen (61%) surveyed and college sophomores, juniors, and seniors (64%) reported using Google Scholar during the past year for course research. To a far lesser extent, high school students in the survey sample (38%) had used Google's scholarly literature search engine.

- 4) In large part, many students in the sample put a premium on consulting with instructors on course research. Almost three-fourths of college students, including freshmen (72%), reported consulting instructors about research assignments, compared to two-thirds of the high school students (66%). Moreover, a large majority of freshmen (80%) and college sophomores, juniors, and seniors (85%) relied on course readings during their research process, far more than did high school students (69%).
- 5) More freshmen (63%) in the sample reported using online and print encyclopedias than did college sophomores, juniors, and seniors (59%) and high school students (58%). At the same time, more college students—sophomores, juniors, and seniors (65%) and freshmen (60%)—had used Wikipedia than high school students (57%).
- 6) The majority of the students sampled reached out to others during the research process. Almost two-thirds of the high school student sample (65%) reported they had relied on classmates during their research process during the last year; slightly more than did college freshmen (63%) and college sophomores, juniors, and seniors (61%). Almost two-thirds of the high school students (62%) in the sample consulted friends/family during their research process, slightly more than college freshmen (60%) and college sophomores, juniors, and seniors (55%).
- 7) Over half of the end-of-year college student respondents reported using libraries during the past academic year. Almost two-thirds of the freshmen (60%) and college sophomores, juniors, and seniors (64%) reported searching library shelves, compared to high school students (57%). At the same time, freshmen (55%) and sophomores, juniors, and seniors (53%) had consulted a librarian in the past academic year, more than did high school students (44%).

As a whole, there was a striking consistency in the proportion of students that reported using the same "Five Go-to Research Sources," (i.e., Google search, library databases, course readings, government sites, and instructors). Importantly, these results suggest students have the same preference for the research tools that they use most, whether they are in high school or college.

In a larger sense, these results are significant when compared with data we collected in our 2010 survey.³⁰ In 2010, our survey sample of sophomores, juniors, and seniors reported using the same top five information sources. This year's survey results confirm our earlier research findings. However, they give us a broader spectrum that considers the habits of students from high school to college.

We conclude that students' preferences for information sources may be very similar over time, given their prioritized use of these five sources. These results may be due to a lack of formal, systematic, and progressive instruction on specialized resources that would expand their research toolbox.

...students have the same preference for the research tools that they use most, whether they are in high school or college.

Evolving Research Practices

A closer examination of the survey results shows an interesting difference between students in high school and college. Almost a third fewer of the high school students in the sample (38%)

³⁰ Head, A. J. & Eisenberg, M. B. (2010). *Truth Be Told: How College Students Evaluate and Use Information in the Digital Age*. Project Information Literacy, 6 - 8. The sample for the 2010 survey was 8,353 undergraduates from 25 US colleges. http://projectinfoit.org/pdfs/PIL_Fall2010_Survey_FullReport1.pdf

used Google Scholar for course research compared to college freshmen (61%) or sophomores, juniors, and seniors (64%). To a lesser extent, fewer high school students (73%) reported using library databases than did freshmen (82%) and sophomores, juniors, and seniors (83%).

These results suggest college students may be prone to consult peer-reviewed academic sources more so than high school students. One logical explanation is that college-level research assignments require more academic sources.

Many may turn to Google Scholar because they are familiar with the Google search interface. Likewise, college students may use library databases more often because they have more available sources and professors expect students to use information from library databases for college assignments.

Overall, our findings suggest that end-of-year freshmen use information resources more similar to their peers in college (i.e., sophomores, juniors, and seniors in college) than their counterparts in high school.

If these results are not due to sampling bias, we conclude that freshmen’s information-seeking behavior may significantly evolve during their first year in college as they begin to align more with the expectations of college-level research. ❖

Conclusion

Since 2008, we have studied how today’s college students find, evaluate, and use information to fulfill course research assignments and solve information problems in their daily lives. We have interviewed and surveyed over 11,000 students from more than 60 US colleges and universities as part of our ongoing research at Project Information Literacy (PIL).

Over the course of our inquiry, we have identified revealing inconsistencies about the practice of research in the digital age. When we first studied how college students find and use information, we discovered a gap between the abundant collection of information academic libraries and the public Web make available and the handful of similar sources used by a large majority of students from one assignment to the next.³¹

In last year’s first Passage Study about the workplace, we found differences between the traditional research skills that employers expected of their new college hires, such as consulting with fellow employees and printed reports, and the research style of new graduates, who tend to work alone, expecting to find everything instantly and online.³²

Finally in this most recent study, we identified the disparity between the Google-centric search skills that many first-term freshmen brought with them from high school and the competencies they needed to meet the far higher research expectations in college.

Moreover, we found freshmen we studied had gaping holes in their understanding of how libraries—and the vast array of digital resources academic libraries provided—could best meet their needs, especially when it came to sifting out the trusted information they wanted.

³¹ Head, A. J. & Eisenberg, M. B. (2010). *Truth Be Told: How College Students Evaluate and Use Information in the Digital Age*. http://projectinfoilit.org/pdfs/PIL_Fall2010_Survey_FullReport1.pdf

³² Head, A. J. (2013). *Learning Curve: How College Graduates Solve Information Problems Once They Join the Workplace*. Project Information Literacy. http://projectinfoilit.org/pdfs/PIL_fall2012_workplaceStudy_FullReport.pdf

Information Tsunami

This year's Passage Study is an extension of PIL's research. Our past focus has been on sophomores, juniors, seniors, and recent college graduates. In this study, we investigated the challenges freshmen encounter and their information competencies as they make the transition from high school to college.

Overall, first-term freshmen emerged as a unique group. The wide variability in their backgrounds and experiences from high school set freshmen apart from their counterparts: the sophomores, juniors, and seniors who were farther along in college.

If anything, freshmen were unified as a group by their inexperience, newness, and lack of awareness about information systems and resources available to them.

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of awareness...**

In the midst of their transition to college, many freshmen were figuring out how to deal with the information tsunami that engulfed them. As one freshman we interviewed explained: "It's figuring out *everything* from paying for classes, to what databases are, to how to find out about assignments, to how to figure out how to use the library, and what professors to take—everything."

The information metrics we developed are a revealing take-away from this study. Our results suggest that first-term freshmen are likely to find a staggering amount of research learning resources available to them in college, compared to what they had in high school. For instance, the average college library in our sample had 19 times as many online library databases and 9 times as many books and journals as the average high school library.

Under these conditions, it is no wonder that freshmen we studied were both "excited" about exploring topics of their own choosing in college, yet also "overwhelmed" by the plethora of information available to them through their library. Deeper into our interviews, we found these comments foreshadowed far-reaching challenges with college research.

It was particularly difficult for freshmen to find and use scholarly sources for the research papers their professors assigned. As a whole, they were largely unprepared for this aspect of college. They had little experience they could transfer from high school, especially when it came to finding scholarly sources in an entirely new setting with so many options.

Stranger in a Strange Land

While most academic librarians already know that freshmen are challenged with college research, some of the most revealing details from our study came from systematic coding of the interview logs. The difficulties with research that first-term freshmen disclosed in their own words, and through their accounts, are another key take-away from our study.

Almost three-fourths of the freshmen we interviewed (74%) said they found it most difficult selecting sources for searching. They struggled with crafting efficient search queries when using the library portal. Many had never used Boolean operators and faceted searching to control the thicket of results their searches usually returned. Moreover, they had little idea of how to create keywords for finding the sources they expected to exist.

Freshmen found synthesizing and tying together a mélange of sources taken from journal articles, books, Web sites, and course readings was challenging. Many had never seen, let alone read, an academic journal article. They floundered at reading and comprehending technical language in scholarly articles and merging passages with their own writing styles.

This laundry list of difficulties is revealing in of itself: First-term freshmen we studied were almost wholly inexperienced with conducting research when they first stepped foot on campus. Many seemed to worry about finding sources. Once finding sources got a little easier for them, they soon realized they were not getting as much out of the resources as they might.

Many had no idea they may need to re-research a topic as their discovery process unfolded and they formulated their thesis. They struggled with evaluating, selecting, and putting trusted information to good use once they found it—the core set of information competencies that are critically important to the college-level research process.

But the story does not end there. We found many first-term freshmen had begun to upgrade their research skills. With the help of librarians and composition instructors, many had discovered the usefulness of journal abstracts. Others had begun to replace their searches on Google with Google Scholar so they could get a finer cut of the academic literature.

We would be remiss, however, if we failed to mention that some freshmen told us that finding and using information for college research was “easy.” It comes as no surprise to learn these students defaulted to the Google search, a tactic that had served them well when completing high school assignments.

As a whole, these findings give us a snapshot of two very different freshmen personas: the budding college researchers and the Google-persistent searchers. It is a limitation of our study that our data cannot tell us how these two behaviors played out for members of our interview sample. However, the end-of-year survey we administered to an entirely different sample of high school and college students sheds some interesting light on this question.

From our survey results, we found a sample of end-of-year freshmen used the same set of “Five Go-To Sources” as do most college and high school students (i.e., Google search, library databases, course readings, governmental sites, and instructors). These findings confirm what we have long suspected: Students are driven by familiarity and habit when it comes to course-related research throughout high school and college.

Yet, at the same time, we found a dramatic difference in the use of Google Scholar between students. College sophomores, juniors, and seniors (64%) and freshmen (61%) used Google Scholar more than high school students (38%) in the sample. These findings suggest that some freshmen may use information-seeking strategies more like their college peers by the time their first year comes to an end.

First-term freshmen we studied were almost wholly inexperienced with conducting research when they first stepped foot on campus.

Arrested Development

It is significant the freshmen we interviewed needed more guidance about how college libraries worked and could best serve them when they were conducting course research. Some said they needed to learn the basics of authenticating and logging on to the library portal. Others needed to

know who to ask for help with finding journals or books on the shelves. Many needed help navigating through the libraries' huge supply of online and on-site sources.

These findings lead us to conclude that even though today's freshmen may have grown up with the Internet, most may know little about how to best leverage formal channels of information that are available through high schools or college.

At the same time, our study raises important questions for librarians and educators. How large of a gap exists between what academic librarians and faculty teach freshmen about research and what freshmen still need to know? To what extent are the objectives of educational programs like the American Association for School Librarians' Standards for the 21st Century Learner achieved by high school seniors?³³

How can college faculty, librarians, and staff most effectively communicate to freshmen about how the library can help them? Moreover, how can we teach students to progress beyond the research styles they learned during their first term in gateway courses, so that they are not bewildered during senior year when they face a far more demanding thesis or final project?³⁴

These questions—and their answers—have significant implications about freshmen, about preparation for college, and about today's college students. An even bigger picture emerges using findings from our past studies of sophomores, juniors, and seniors. Collectively, our findings suggest that many students have trouble conducting research through their entire college career, especially as they enter their majors and research assignments become more open-ended and intellectually demanding.

For example, when we surveyed undergraduates in our 2010 large-scale survey, 8 in 10 of our 8,353 respondents reported having overwhelming difficulty getting started on research assignments and determining the nature and scope of what was expected of them.³⁵ Nearly half of the students in our survey sample experienced nagging uncertainty about how to conclude and assess the quality of their research efforts.

If instruction efforts are not stepped up early many freshmen run the very real risk of “flatlining.”

Based on our studies, we believe that the greatest gains may occur by focusing on teaching freshmen. This is a time when students are new to higher learning and most excited about discovering more about topics that interest them. Moreover, there needs to be coordinated efforts between librarians and educators, so that information literacy is taught in a progressive and contextual manner.

If instruction efforts are not stepped up early many freshmen run the very real risk of “flatlining.” By this we mean that the research styles students develop during their ever-important first year could become static as they progress as sophomores, juniors, and seniors. Neglecting this will greatly impede their ability to solve information problems once they graduate, join the workplace, and continue as lifelong learners. ❖

³³ *Standards for the 21st Century Learner* (2007). American Association of School Librarians (AASL), Chicago, IL. http://www.ala.org/aasl/sites/ala.org.aasl/files/content/guidelinesandstandards/learningstandards/AASL_LearningStandards.pdf

³⁴ Gateway courses are introductory courses in college that give students foundational knowledge.

³⁵ Head, A. J. & Eisenberg, M. B. (2010). *Truth Be Told: How College Students Evaluate and Use Information in the Digital Age*. Project Information Literacy. http://projectinfoilit.org/pdfs/PIL_Fall2010_Survey_FullReport1.pdf

Recommendations

A third of the freshmen that began US colleges and universities this fall will not return to campus next year.³⁶ There has been much discussion about these sagging retention rates, both the reasons why and the solutions for addressing them.³⁷

We conclude this report by presenting recommendations for librarians, faculty, and administrators who work with freshmen. Drawing on our findings, we discuss means of improving how freshmen are taught, coached, advised, and guided through learning the college-level research process.

Our recommendations may not be applicable to every campus but we hope they will stimulate conversations among stakeholders—librarians, educators, and administrators—as entering classes in US colleges and universities increase with each passing year.

Recommendation #1: Building bridges between high school and college libraries

We were struck by freshmen in our sample that thought they were at a disadvantage with research from the start. When professors assigned college research assignments, many of these students said they had no clue about where to begin. It was not that they were not good at research—they *were entirely new to library research*. In particular, these first-term students had little experience with research in high school libraries. Moreover, they had written so few high school research papers they had a very limited understanding of what the research process entails and how libraries could best help them. For example, some freshmen we interviewed were surprised to learn help was available to them from reference librarians just by asking. Others thought that everything a library owned was online so going to the academic library on campus was not necessary. Misconceptions like these about libraries are likely to perpetuate as long as school libraries are underfunded, do not hire full time professional teacher-librarians, and, in some cases, are decommissioned.

...it is imperative for higher education librarians and educators to recognize the plight of school libraries—and the widespread impact it is having.

We believe it is *imperative* for higher education librarians and educators to recognize the plight of school libraries—and the widespread impact it is having. Many US school libraries from kindergarten to high school are fighting for their survival: From 2007 to 2011, the number of employed school teacher-librarians in the US decreased more rapidly than other type of school staff.³⁸ In California's school libraries, the books on school library shelves were published 10

³⁶ For more details about freshmen retention rate see The National Information Center for Higher Education Policymaking and Analysis's "First-Year Retention: Retention Rates: First-Time College Freshmen Returning Their Second Year" <http://www.higheredinfo.org/dbrowser/index.php?measure=92> and *US News and World Report's* data from 2008 – 2011 in "Freshman Retention Rate: National Universities," <http://colleges.usnews.rankingsandreviews.com/best-colleges/rankings/national-universities/freshmen-least-most-likely-return>

³⁷ Our "Smart Talk" interview, which was released at the same time as this report, was with Dr. David Conley, one of the leading thinkers and policy analysts about college readiness. See <http://projectinfolit.org/st/conley.asp>

³⁸ *School Librarians Bear the Brunt of Staff Reductions* (2013). American Library Association, Chicago, IL. <http://www.ala.org/news/state-americas-libraries-report-2013/school-libraries>

years ago, on average, and have little value to students working on assignments.³⁹ The decline of school libraries and librarians is not only an issue for K-12 education—it needs to be recognized as an issue affecting higher education issue, too. More bridges need to be built between high school and college and university libraries, educators, and administrators. How can college-bound high school students be better prepared for what to expect from college-level research? What existing collaborative efforts between high school and college and universities can be shared as a basis of replication? There is much to be gained from establishing an ongoing dialog and formal relationships between high school teacher-librarians and academic librarians as well as staff in first-year experience programs and faculty who teach first-year students.

Recommendation #2: An integrated approach to teaching information competencies

Nearly one in three of the first-term freshmen we interviewed said librarians were the most helpful individuals on campus when learning the college research process. Many of these students had come to know librarians through "one shot" sessions. One-shot sessions, as librarians refer to them, is when an instruction librarian visits a class and delivers a one or two hour of session on conducting scholarly research. While one-shots were helpful in steering freshmen in our sample in the right direction, there were students who wanted more hands-on help. For instance, freshmen said they had trouble remembering the steps needed for searching the library portal the librarian had shown them in class. Other freshmen said they wanted to learn more about available sources for assignments than the one-shot session covered. Still, others said they struggled with evaluating and selecting quality sources from all they had found and needed more guidance. As a whole, most freshmen did not ask for help from a librarian later on, once the one-shot session had ended.

We think it is essential librarians teach students transferable information concepts that are integrated into lower and upper division courses, instead of focusing on search skills in brief encounters with students. We are not suggesting *all librarians* provide this latter kind of resource-focused training—but we know that many do. One approach to teaching students enduring research competencies is embedded librarianship.⁴⁰ This is when librarians work in strategic partnerships with faculty who teach freshmen, and with others stakeholders on campus, as students' research workflow process occurs on specific assignments.⁴¹ Embedded librarianship is different from one-shots because librarians become more extensively integrated into the teaching of first year students as faculty and instructor. This way, they are likely to have an equalizing force in the wide variability of research skills freshmen bring from high school. Social media can be included in the mix, too. Embedding modules into the research process—better help systems, short Web-based tutorials, and explanatory YouTube videos—helps students, in general, learn about research in context as the process unfolds. Librarians need to take charge of this initiative on their campus. Our fear is that if they don't, no one else will, despite its fundamental importance

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³⁹ Statistics About California School Libraries. California Department of Education, Sacramento, CA: <http://www.cde.ca.gov/ci/lb/schoolibrstats08.asp>

⁴⁰ For an overview and examples of embedded librarianship in practice, see Shumaker, D. (2012). *The Embedded Librarian: Innovative Strategies for Taking Knowledge Where It Is Needed*. Medford, NJ: Information Today.

⁴¹ See Riehle, C. F., & Weiner, S. (2013). High-Impact Educational Practices: An Exploration of the Role of Information Literacy, Critical Thinking, and Lifelong Learning. *College & Undergraduate Libraries* 20(2):127-143.

to a student's success. Librarians need to promote their services and work with staff in first-year experience programs and faculty who teach first-year students. They also need to collect data about how their continued presence in the research workflow makes a difference.

Recommendation #3: Faculty and apprenticing and the research process

Throughout our interviews, freshmen mentioned the value of their English Composition courses in teaching them how to write a college-level research paper. Importantly, composition instructors scaffolded the research process for freshmen to make explicit what the college-level research entailed. In particular, freshmen drafted and revised papers as the course progressed. They may have had an annotated bibliography or a thesis paragraph due as a stand-alone assignment. Through this process, the components of "good" research were integrated into instruction through a series of assignments. We applaud these efforts. At the same time, though, we ask why this approach to college research assignments does not happen far more frequently, especially during students' first year in college when there is great potential to make strides?

It concerns us that information literacy—the very challenging task of finding, evaluating, using, and applying information—is often compartmentalized as the responsibility of certain faculty in certain disciplines on so many campuses. In this recommendation, we suggest that faculty across the campus rethink the way their research papers are packaged and assigned (if they require them in their classes). Why not assign one research paper, rather than five less demanding ones? Why not integrate advising and training into the course from librarians? Freshmen could be asked to *apprentice the research process*—instead of to magically write and deliver—a research paper. Undergraduate research programs have made strides in this area. Traditionally, apprentices learn their trade under the guidance of a journey-level craftsman. If it was done meaningfully, such "research apprenticeships" could teach freshmen about scholarly research across disciplines, and how the methods and quality of sources may differ. Furthermore, they could help freshmen learn the college research trade—and knowledge production—from different disciplinary standpoints that would ideally lead to deeper learning to be applied in other courses.

Recommendation #4: Resetting expectations of the Google Generation

In 1927, Dr. C. W. Edwards, a professor of physics at Duke University, authored the essay, "Why Freshmen Fail." In the opening paragraphs, he claimed, "the most important and ordinary cause of failure lies in the fact that, as a class, they have never learned to *dig* and *dig* and *dig* until the assignment is completed."⁴² Almost a century later and squarely in the digital age where information proliferates, would Dr. Edwards make the same argument? Some of the comments from our freshmen interviews suggest that faculty today may agree with this professor's earlier claim. Yet in our study, we found few of the freshmen we studied knew how to "dig and dig and dig" until an assignment was completed. Most freshmen we interviewed said they were "overwhelmed" at the prospect of digging for research sources using a campus library that could have 19 times as many library databases than their high school library. Moreover, they discovered that coming up with keywords for searching a scholarly database like Lexis-Nexis has very little in common with the Google searches they executed many times before. Others said they had little practice with choosing credible and trusted sources and extracting the passages they needed. They had no idea how to read and integrate different writing styles from scholarly works

...few of the freshmen we studied knew how to "dig and dig and dig" until an assignment was completed.

⁴² C. W. Edwards (1927). Why Freshmen Fail. *High School Journal*, 10:5, 120-125. Italics are original, not added.
<http://www.jstor.org/discover/10.2307/40359812?uid=2&uid=4&sid=21103126792193>

into the paper they were writing. As one of the freshmen explained, faculty assume a lot about what freshmen know, or do not know, from high school. Even though the majority of today's freshmen may belong to the "Google Generation," we conclude that it does not mean they are skilled at developing research strategies for fulfilling college assignments.

In our final recommendation, we suggest that stakeholders—educators, librarians, and administrators—reframe their expectations of today's freshmen, particularly as information seekers, users, and creators. It is incorrect to assume that because most of today's freshmen grew up with a thriving Internet at their fingertips, they are naturals at college-level research. The cognitive skills needed for scholarly inquiry are very different than finding ready-made answers using a Google search. One starting point could be to initiate a campus dialogue to increase awareness about the information practices of today's freshmen, including both the strengths and weaknesses they bring to the college. What challenges do freshmen themselves mention about completing course work that calls for finding, using, and retaining information? What do freshmen say helps them most when learning how to navigate the complex information landscape of their new campus? If there is a gap on an individual campus, how can it be closed through coordinated efforts and pooled resources that promote training, curriculum, and advising by librarians, faculty in a range of disciplines, tutors, peer advising, and administrators? How can efforts be coordinated with high schools? There are important gains to be made through open and informed discussion with different stakeholders on individual campuses. Informed dialogue may give rise to new collaborative efforts that would better prepare freshmen for succeeding as information users in their coursework and after graduation. ❖

Appendix A: Methods

The purpose of this study was to begin to investigate how freshmen make the critical information transition to college as information-seekers, users, and creators. Specifically, we examined how selected first-year students learn to conduct college-level research and adopt and use new information competencies and strategies.

We defined the following five research goals for our study:

- 1) To examine how the information landscape and available research learning resources—sources of help, computer workstations, print books and periodicals, and online sources,—may differ between secondary and higher education institutions.
- 2) To explore how freshmen learn to navigate the complex digital information spaces and meet the challenges and difficulties of college-level research.
- 3) To investigate the “college-level research readiness” of freshmen as far as the learning development, practice, and adaptability of information competencies and strategies used for college-level research.
- 4) To understand how freshmen’s use of research resources may differ from that of high school students and of college sophomores, juniors, and seniors.
- 5) To enrich our understanding of the gaps that may exist between the expectations that college instructors have of their first-year students and the competencies and strategies these students bring with them, adapt, and begin to learn in college.

This study’s primary contribution is to develop a deeper understanding about what it is like for first-year students—in their words and through their experiences—to make the information transition from high school to college. Findings are intended for librarians and educators so they may understand the readiness of freshmen and the challenges freshmen face.

Data Collection

The PIL Team used three different methods to collect data for this study: (1) a short survey of US librarians at 30 high school libraries and 6 college and university libraries; (2) in-depth, face-to-face interviews with 35 first-term freshmen at 6 US colleges and universities; and (3) an online survey administered to a voluntary sample of 1,941 US high school and college students. Data collection occurred between November 8, 2012, and August 15, 2013.

Part One: Research Learning Resources

We collected data about the availability of research learning resources at 30 high school libraries and libraries at 6 college and university librarians from June to September 2013.⁴³ Telephone and email interviews were used to collect the data. The sample was derived from the high schools that 31 of the first-term college freshmen interviewees had attended (Appendix A, Figure 1).

⁴³ A total of 35 freshmen interviews were conducted. We used a sample of 30 high schools in our research learning resources analysis. Two of the interviewees graduated from the same high school during the same year, giving us a count of 31 high schools for our matriculation calculations. Four data were counted as “missing.” Two high schools were located in Europe and beyond the study population of the US, one high school had closed, and we were unable to ascertain where one freshman had attended high school.

Appendix A, Figure 1: High Schools Represented in Learning Resources Interviews

High School (n=30)	Type	Location	Enrollment	Classification
Arbor View	Public	Las Vegas, NV	2716	Large
Benet Academy	Private	Lisle, IL	1351	Large
Cary Academy	Private	Raleigh, NC	400	Small
Christ Presbyterian Academy	Private	Nashville, TN	440	Small
College Park	Public	Pleasant Hill	1993	Large
Duchesne Academy of Sacred Heart	Private	Houston, TX	250	Small
Eastside Catholic	Private	Sammamish, WA	634	Small
El Molino *	Public	Forestville, CA	729	Small
Haddonfield Memorial	Public	Haddonfield, NJ	758	Small
Healdsburg	Public	Healdsburg, CA	758	Small
Helena *	Public	Helena, MT	1655	Large
Hillcrest	Public	Tuscaloosa, AL	1300	Large
John Overton *	Public	Nashville, TN	1845	Large
La Jolla	Public	San Diego, CA	1591	Large
Madison	Public	Middletown, OH	750	Small
McLean	Public	McLean, VA	1952	Large
Milton Academy	Private	Milton, MA	675	Small
Mountain View *	Public	Mesa, AZ	3000	Large
New Albany	Public	New Albany, OH	1175	Small
Newark *	Public	Newark, OH	1422	Large
Newbury Park	Public	Newbury Park, CA	2612	Large
Piner *	Public	Santa Rosa, CA	1054	Small
Redondo Union	Public	Redondo Bch., CA	2505	Large
Santa Margarita	Private	Sta. Margarita, CA	1650	Large
Santa Monica	Public	Santa Monica, CA	3114	Large
Sheridan *	Public	Sheridan, MT	76	Small
St. Joseph's	Private	Lakewood, CA	868	Small
Westlake	Public	Westlake Village, CA	2379	Large
Weston	Public	Weston, MA	748	Small
Zion Christian Academy	Private	Columbia, TN	220	Small

*n = 30 librarians interviewees (two students attended the same high school). In total, these 30 high schools have 40,620 high school students enrolled. * High schools that were recipients of Title I federal funding due to high percent of low income students (n = 7).*

In Appendix A, Figure 2, we provide details about the institutions in the librarian sample from colleges and universities.⁴⁴

Appendix A, Figure 2: Colleges and Universities Represented in the Librarian Interviews

College / University (n=6)	Type	Location	Enrollment	Classification
Belmont University	Private	Nashville, TN	6,650	Small
California Maritime Academy	Public	Vallejo, CA	889	Small
Harvard College	Private	Cambridge, MA	6,656	Small
Mesa Community College	Public	Mesa, AZ	12,930	Large
Ohio State University, Newark	Public	Newark, OH	2,098	Small
Santa Rosa Junior College	Public	Santa Rosa, CA	24,347	Large

n = 6 librarian interviewees. In total, these colleges and universities have a total of 53,570 undergraduates enrolled.

At each library, we interviewed a librarian who knew the library collection well, e.g., the director, or the head of reference, student instruction, or collection development. We collected data about the professionals on staff (employees with an MLS), and public computer workstations in the library, size of his or her library’s collection (number of volumes and periodicals), and the number of online, subscription-based databases.

We also collected descriptive data about the institution’s full-time student enrollment. These data allowed us to control for enrollment size (i.e., small vs. large institutions) in our comparison that appears in Part One of the report.

We used the median for student enrollment in both high schools and colleges as our basis of dividing the sample by small and large sizes. Given our sample, we determined that the median enrollment size for small high schools was any school with an enrollment of fewer than 1,175 students. The median enrollment for small colleges and universities was any higher education institution with an enrollment of less than 6,654 students.

We provide summary statistics for the segmented sample in Appendix A, Figure 3. These statistics offer a description of the data, including the means (i.e., averages) that allow for the calculation of ratio comparisons.

In order to prepare for the ratio comparison analysis, we next calculated the mean (e.g., average) for research learning resources in each of the four institutional settings in our sample.

⁴⁴ We are deeply grateful to the research liaisons at each of the following institutions in the sample who volunteered their time and help: Jenny Rush, Belmont University; Michele Van Hoeck, California Maritime Academy; Sue Gilroy and Karen Heath, Harvard College; Marjorie Leta, Mesa Community College; Susan Scott, Ohio State University, Newark; and Nancy Persons, Santa Rosa Junior College.

Appendix A, Figure 3: Summary Statistics for Research Learning Resources (i.e., mean values)

	Small High Schools	Large High Schools	Small Colleges/ Universities	Large Colleges/ Universities
Number of professional staff w/ MLS degrees	1.2	.87	9	24
Number of computer workstations w/printers	25	35	126	250
Size of collection	14,425	19,139	164,836	127,000
Number of online library databases	14.4	13.2	469.5	51
Full-time student enrollment	636	2,072	4,073	18,639

n = 30 high schools and 6 colleges and universities

Part Two: First-Term Freshmen Interviews

We conducted face-to-face interviews with 35 freshmen at 6 US colleges and universities during November and December 2012. Appendix A, Figure 4 (next page) shows a breakdown of the demographics for this sample.

We used the interviews to explore the processes and strategies that these freshmen used to complete their research assignments, the difficulties they faced, and how they adapted to those challenges. We recruited our interview sample with the help of PIL research liaisons.⁴⁵ Liaisons reached out to composition instructors on each campus, who circulated a sign-up sheet in their classes asking for voluntary participation in a study about being a first-time freshman.

The large majority of the sample (91%) was between 18 and 20 years old. Other respondents (9%) were over 30, or "non-traditional students," who had delayed enrollment. The sample was almost evenly divided by gender, with slightly fewer of the interviewees being male (46%).

Eight in 10 of the first-term freshmen sample (80%) had graduated from high school within six months of our interview. The majority of the sample reported a cumulative grade point average (GPA) from high school was between 3.4 and 4.0+ (51%). As a point of reference, we calculated this GPA as between a B+ and A.⁴⁶

Some freshmen in the sample had an interest in majoring in architecture or engineering (23%) or arts and humanities (23%). Other respondents were thinking about the sciences (17%), business administration (14%), social sciences (11%), occupational training (3%), or were enrolled to fulfill general education requirements or were unsure (3%). A small number of respondents (6%) were considering a double major (usually in humanities and social sciences).

⁴⁵ At all 6 campuses, we consciously decided against having librarian research liaisons recommend prospective interview participants so we could avoid introducing bias about the library and its use.

⁴⁶ For this analysis, we used the University of Washington's scale for translating GPA to letter grades, courtesy of the Office of Registrar, http://www.washington.edu/students/gencat/front/Grading_Sys.html

Appendix A, Figure 4: Description of Freshmen Interview Sample

Demographics	Count	Frequency
Gender		
Female	19	54%
Male	16	46%
Total	35	100%
Age range		
18 to 20 years old	32	91%
Over 30 years old	3	9%
Total	35	100%
Type		
Private College/University (4-year)	13	37%
Public College/University (4-year)	12	34%
Community College (2-year)	10	29%
Total	35	100%
Area of interest		
Architecture/Engineering	8	23%
Arts and Humanities	8	23%
Business Administration	5	14%
General Education (AA, undeclared)	1	3%
Occupational Training (inc. Nursing)	1	3%
Social Sciences	4	11%
Sciences	6	17%
Double Majors	2	6%
Total	35	100%
High school graduation year		
2012	28	80%
2011	4	11%
Before 2011	3	9%
Total	35	100%
GPA from high school		
2.1 – 2.3	1	3%
2.4 – 2.6	--	--
2.7 – 3.0	6	17%
3.1 – 3.3	7	20%
3.4 – 3.7	7	20%
3.8 – 4.0+	11	31%
Declined to State	3	9%
Total	35	100%

n = 35; percentages may not add to 100% due to rounding

Interviewing Procedures

Prior to conducting the freshmen interviews, each PIL interviewer reviewed and then pre-tested the script. Pre-tests were conducted with 4 students who were enrolled in institutions other than those in our study.⁴⁷ After the pre-test phase, interviewers made minor suggestions for wording changes in the script protocol. For a copy of the interview script used in sessions, see Appendix B of this report.

Our interviews with participants took place in library conference rooms at each institution in our sample. PIL interviewers did not conduct interviews with any participants enrolled at their home campus. Interviews were conducted at different times of the day to accommodate interviewees' schedules. On the average interviews lasted an hour, with some lasting up to an hour and a half, if interviewees chose to continue the discussion during the interview debriefing.

PIL interviewers began the interview by explaining the procedures and obtaining verbal consent from the interviewee. Next, interviewers asked interviewees open-ended questions in audio-recorded sessions about the information sources, practices, and strategies they used to complete college-level research assignments, and the challenges they had encountered in their first few months on campus.

We collected qualitative data from the respondents about five topics: (1) the information sources they had been using for their research assignments, (2) how finding information on their college campus was different from finding information at their high school, (3) challenges and difficulties they had encountered with the college-level research, (4) new research strategies they were developing, and (5) who had been most helpful to them with finding and using information on their college campus. Following the interview, each participant was debriefed about the study's purpose and thanked for their participation.

Coding Methods

Two members of the PIL Research Team used latent coding methods for analytic reduction and the interpretation of underlying patterns in the freshmen interview data. The coding guide we developed was influenced by the Association of College and Research Libraries' (ACRL) information literacy standards, *Habits of Mind*, 16 formalized thinking characteristics of critical thinkers, and PIL's prior research about students' difficulties with conducting research.⁴⁸

The interview logs were coded for 14 individual properties that we found freshmen used to describe their difficulties with the college-level research. Two CITI certified coders identified *latent properties* of the interviews that referred to these difficulties, frustrations, and challenges. Latent coding requires the coder to make qualitative and critical interpretations of inferred meanings in a text. Our coding text was the interview log (141 pages, single-spaced), which was based on the 35 interviews we had conducted.

We went through four rounds of pilot test coding using the same small set of interviews (i.e., the logs from 8 interviews). We ran Krippendorff's Alpha (i.e., KALPHA), the most rigorous means of testing intercoder reliability. KALPHA takes into account chance agreement among content

⁴⁷ We pilot tested the freshmen instrument and interview protocol with students enrolled at the University of Memphis, Ohio State University (main campus in Columbus), and Phoenix College, where PIL Research Team members were employed.

⁴⁸ The ACRL standards for information literacy competencies in higher education are available at <http://www.ala.org/acrl/standards/informationliteracycompetency>. Costa's and Kallick's (2000) collection of 16 thinking dispositions exhibited by critical thinkers is available at http://www.chsvt.org/wdp/Habits_of_Mind.pdf

analysis coders and, in our case, was adjusted for ratio variables since we were comparing scores compiled using latent coding. We used the ReCal OIR Web site to run our KALPHAs.⁴⁹

Although there is no universally accepted standard for intercoder reliability, communication researchers have written that a coefficient between .81 and .99 is "almost perfect," between .61 and .80 is "substantial," and .41 to .60 is "moderate." We used four iterative pilot test rounds, our coding practices reached the acceptable reliability level of .77. Thereafter, the two coders proceeded from testing to actual coding of the interview logs.

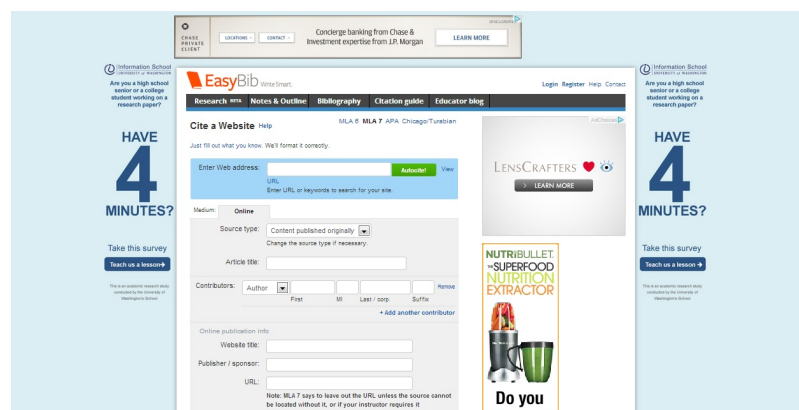
Part Three: Online Survey

We collected data from a voluntary sample of students in an online survey we administered between May 3, 2013, and May 10, 2013. We used the data to investigate how the information resources a sample of college and high school students had used on research assignments in the past academic year.

We used an entirely different dataset from the first-term freshmen sample we used in Part Two's qualitative interviews. As far as we know, none of the freshmen that appeared in the fall first-term freshmen participated in the online survey.

To recruit the voluntary survey sample, we posted a display advertisement that was a call for participation on the free version of a widely used bibliographic generator site (see Appendix A, Figure 5 for a screen shot).⁵⁰ The ad featured a link to the voluntary PIL survey. The survey form was located on a secure server at the University of Washington, where PIL works in partnership with the iSchool.

Appendix A, Figure 5: Screen Shot of Call for Online Survey Participation



n = Call for participation, online survey, *n* = 1,941 respondents

⁴⁹ ReCal shareware is available at <http://dfreelon.org/utis/recalfront/>, courtesy of D. Freelon, an Assistant Professor at American University who developed the program.

⁵⁰ A link to the PIL survey appeared on the EasyBib site, an Imagine Easy Solutions flagship product. Over 40 million student writers use EasyBib's citation and research resources annually. The PIL survey had two survey questions related to students' citation behaviors, however, Imagine Easy Solutions staff had no input into the PIL survey instrument. Imagine Easy Solutions is an educational start-up company offering citation, note taking, and research tools. PIL is grateful to Imagine Easy Solutions' for their support and collaboration on posting the PIL survey.

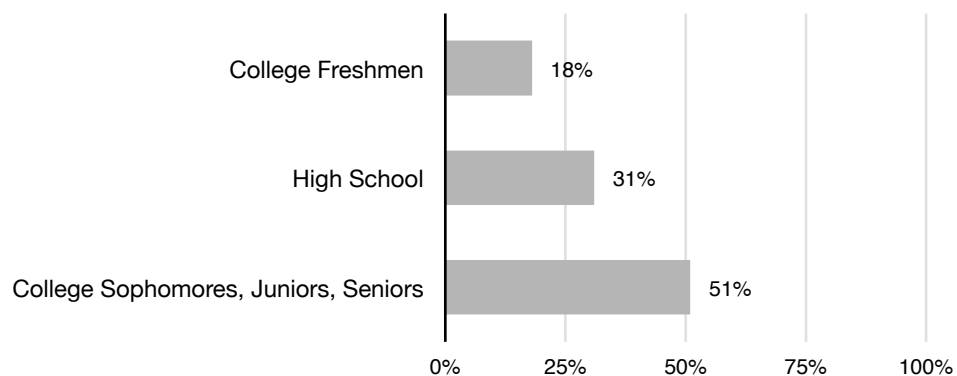
We provided both a written consent for potential participants, who were over 18 years old, and an assent for those less than 18 years old. Since we did not collect any personal identifiers, including IP addresses of respondents, assent did not require the consent of a parent or legal guardian for respondents who were minors.

The 13-item survey asked respondents questions about the sources they had used for research assignments throughout the year and the challenges they had with creating citations. We intentionally posted the survey during spring when potential respondents worked on their final research assignments for the year.

Survey Sample

The sample size we used during data analysis had 1,941 responses. Our intention was to collect 8 class levels of high school and college students (i.e., freshmen, sophomores, juniors, and seniors in either setting). In Appendix A, Figure 6, we present a simplified view of the sample breakdown by the type of institution respondents were attending at the time they took the survey.

Appendix A, Figure 6: Survey Sample Breakdown by Institutional Type



n = 1,941 respondents

Collectively, our sample was made up of college freshmen ($n=358$), high school freshmen, sophomores, juniors, and seniors ($n=600$), and college sophomores, juniors, and seniors ($n=983$). Appendix A, Figure 7 provides details about the demographic makeup of the online survey sample.

Appendix A, Figure 7: Description of Online Survey Sample

Demographics	Count	Frequency
Gender		
Female	1110	57%
Male	582	30%
Declined to state	232	12%
Total	1941	100%
Age range		
15 to 16 years old	316	16%
17 to 18 years old	370	19%
19 to 20 years old	467	24%
21 to 22 years old	341	18%
23 to 24 years old	120	6%
Over 25 years old	187	10%
Declined to state	109	6%
Other	8	1%
Total	1941	100%
Current level in school		
High school freshmen	82	4%
High school sophomore	86	4%
High school junior	65	3%
High school senior	367	17%
College freshmen	358	17%
College sophomore	346	16%
College junior	308	14%
College senior	329	15%
Total	1941	100%
GPA		
Below 1.6	36	2%
1.7 – 2.0	36	2%
2.1 – 2.3	46	2%
2.4 – 2.6	101	5%
2.7 – 3.0	266	14%
3.1 – 3.3	326	17%
3.4 – 3.7	495	26%
3.8 – 4.0+	472	24%
Declined to state	79	4%
Doesn't apply	36	2%
Don't know	36	2%
Total	1931	100%

*The number of participants varies per category, due number of responses per question.
Percentages may not add to 100% due to rounding.*

Ethical Considerations

Prior to our data collection efforts for the freshmen interviews during fall 2012 and the online survey during spring 2013, we underwent Human Subjects Division (HSD) review. The interview protocol review for the freshmen interview took place at Harvard, where the PI, Alison Head, is a faculty associate at the Berkman Center.

The protocol received approval before the study began.⁵¹ Reviewers determined that PIL's proposed study plan was ruled exempt. That is, the study was exempt since the research was about the effectiveness of classroom methods and instructional techniques.

The protocol for the student online survey underwent review at University of Washington. The protocol received approval for a minimal risk expedited study, where the PI, Alison Head, works in partnership with the iSchool.⁵² That is, the survey, which included sampling high school students who were minors, did not have the probability and magnitude of causing any more physical or psychological harm than is normally encountered in daily life.

Methodological Limitations

There are challenges associated with the use of interviews in research.⁵³ One issue is with using interview methodologies, which depend on participants' provision of accurate and complete answers. Accordingly, the interviewer must endeavor to establish trust and rapport while keeping track of the responses.

Bias on both sides of this kind of exchange is always a formidable issue. Bias can be readily introduced in the way the interviewer frames a certain question, or the way in which a respondent interprets and then answers it.

Another issue is the generalizability of the data collected from qualitative interviews. When considering the limitation of the generalizability of interview data, we point to the main purpose of qualitative research: interviews are not necessarily used to produce generalizable findings about a sample. They are used to arrive at a deep understanding of a specific situation, such as the information transition from high school to college.

Therefore, our findings are not representative of all freshmen or all undergraduates who may have been enrolled on the same campuses where we conducted interviews or collected data using the online survey. Our findings, however, reveal consistent patterns from respondents that do lend credibility to our findings about the differences between high school and college-level research practices and strategies.

Despite making every attempt to compensate for the limitations of our study methodologies, we fully acknowledge future research is required to confirm our findings, especially as it may apply to others in the college population. However, these findings should not be viewed as comprehensive, but as part of our ongoing research. ❖

⁵¹ The PIL Research Protocol for the fall 2012 freshmen interviews was approved by Harvard University, Human Subjects Division and was granted approval (#F22951-101) on August 30, 2012. The protocol title was entitled, "Learning the Ropes: How First-Time Freshmen Develop Research Strategies for Surviving College." Since PIL's Director, Alison Head, works in affiliation with Harvard's Berkman Center for Internet and Society as a faculty associate and Harvard freshmen were in the sample, Harvard's HSD was used for this phase of the study.

⁵² The PIL Research Protocol for spring 2013 online survey was approved by University of Washington, Human Subjects Division and was granted approval (#45009) on April 26, 2013. The protocol title was entitled, "Learning the Ropes: How First-Time Freshmen Develop Research Strategies for Surviving College." Since PIL conducts its ongoing research in partnership with UW's Information School, the UW HSD was used.

⁵³ We acknowledge the following paper for its review of the methodological issues with the interviewing technique: S. Sharma, (2010). Qualitative Methods in Statistics Education Research: Methodological Problems and Possible Solutions. *ICOTS8 Conference Paper*, International Association of Statistical Education (IASE), http://www.stat.auckland.ac.nz/~iase/publications/icots8/ICOTS8_8F3_SHARMA.pdf

Appendix B: Freshmen Interview Script

Introduction to the interview

(This script is used after verbal consent is obtained from the participant)

Hi, thanks for making time today to talk further with me. For the next 30 to 45 minutes, I want to ask you about what it is like being a first-time college student on your campus. I am particularly interested in how you navigate your new information environment. How do you find information to help you complete research assignments and get your work done as a student?

[Summarize these points]

- Conducting interviews with other first-time college students at 5-6 other institutions in the US this fall.
- Results will be brought together and used for informing an online survey we will administer in spring 2013.
- Before we begin -- some things to make our discussion more productive:
 - No wrong answers;
 - Don't hold back;
 - Feel free to share your opinion and experiences;
 - Interested in negative as well as positive experiences;
 - Assured confidentiality (name will not appear in results);
 - As to timing – 60 minutes, no longer, could be even be shorter and that's fine.

My role:

- Ask questions;
- Listen, I won't participate in the actual discussion, as far as my own opinions.

KEY FOCUS OF THE INTERVIEW

Let's begin. Today, we're going to be talking about what is it like being an incoming student on your college campus. In particular, we want to hear about how you settle into your new information environment. We'd also like to hear what it's like for you once you started classes and needed to find information for research assignments.

So we're both on the same page, let me define what I mean by the phrase "finding and using information for assignments." We mean the process of defining a topic and searching and collecting information sources for working on course-related research assignments.

We know there are many different places to look for information—the Web, someone you know and ask for information, libraries, professor's offices, books, and newspapers. We want to hear about all the different kinds of strategies that you use. Any questions? Shall we begin?

Question 1.

Let's start with a game. Can you give me one or two adjectives (or words) that describe how it feels to come into a new place, like this campus, and need to find and use information to fulfill assignments for courses?

Question 2.

Let's talk about finding and using information for the courses you are taking now. Have you had to look for information for any course-related research assignments, yet?

YES, I have looked for information for course-related research assignments

NO, I have not looked for information for course-related research assignments

OTHER:

Question 3.

If the participant answered yes to Questions 2 (i.e., has looked for information for a course-related assignment) then ask:

Can you tell me in order where you looked for information for a course-research assignment you've done as a college student? Where did you look FIRST, SECOND, THIRD, and so on? (Researcher: please rank from first to last in your answer.)

Question 4.

How is finding and using information on this campus different than it was at your high school? What have you found is the SINGLE biggest difference between finding information in college vs. high school?

Question 5.

Did you graduate from a PUBLIC or a PRIVATE high school?

(If "other," please explain)

Question 6.

How difficult would you say it is to find and use information for course-related research assignments? (1-7 scale with 1 being easy and 7 being very difficult)

Question 7.

Can you give me a specific example—tell me a story—about what made the process of finding and using information you needed difficult?

Question 8.

What would you say are TWO of the biggest challenges you've encountered with finding and using information on this campus for use in coursework?

Question 9.

Have you developed any new strategies to deal with finding and using information here? What are they? Where did you learn them/from whom?

Question 10.

Who have you found are the THREE most helpful people on this campus when it comes to finding and using information for course-related research assignments? (i.e., have the student rank most helpful, second most helpful, and third most helpful.)

Question 11.

Now, let's talk about access to professors, that is instructors teaching your classes this term. So far, what has it been like trying to obtain information from professors on this campus?

Question 12.

How about to administrators, that is for things like signing up for classes, finding out requirements, or getting scholarship information. So far, what has it been like trying to obtain information from administrators on this campus?

Debrief and thank the participant for their time. Explain what the study is about and when the report will be released and how they may obtain a copy.

Question 13.

AFTER THE INTERVIEW AND DEBRIEFING:

Are there any other comments or quotes from the participant that you'd like to include from the participant?

Question 14.

AFTER THE INTERVIEW FOR THE RESEARCHER TO COMPLETE:

What is the name of the INSTITUTION where this interview occurred?

Belmont University
California Maritime Academy
Harvard
Mesa Community College
Ohio State Newark
Santa Rosa Junior College

- END -

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- AJH
December 5, 2013